

kilobaud

MICROCOMPUTING^{T.M.}

**DON LANCASTER
TELLS HOW TO
WIN THE MICRO GAME. P. 36**

**80-COLUMN DRAGON SLAIN:
WIDE-SCREEN WIZARDRY
FOR APPLE II. P. 100**

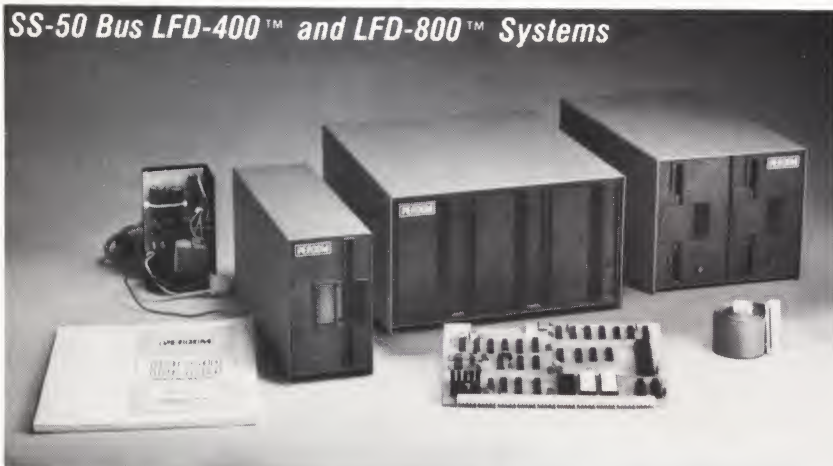
**THE ESSENTIALS
OF EFFICIENT
PROGRAMMING. P. 198**

THE 16-BIT
SUPER PROCESSORS
ARE HERE!



A Few Extraordinary Products for Your 6800/6809 Computer

SS-50 Bus LFD-400™ and LFD-800™ Systems



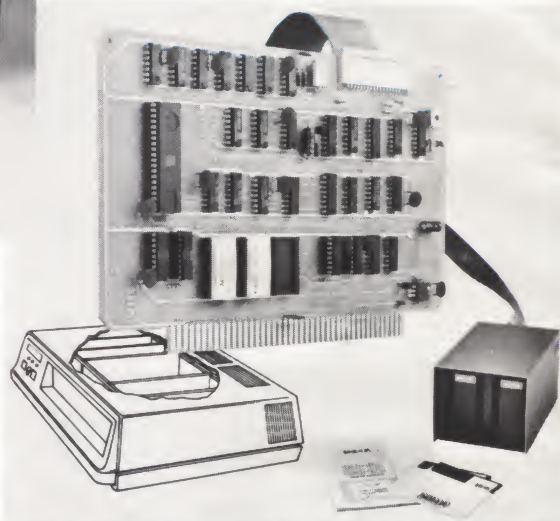
From Percom . . .

Low Cost
Mini-Disk Storage
in the Size You Want ✓ 14

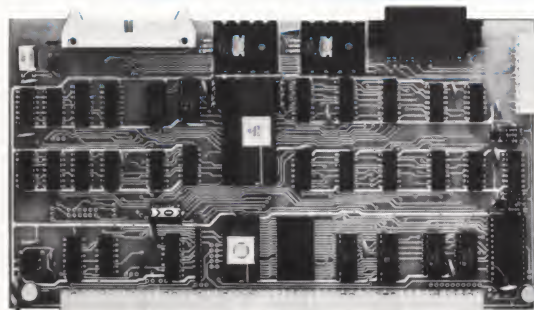
Percom mini-disk systems start as low as \$599.95, ready to plug in and run. You can't get better quality or a broader selection of disk software from any other microcomputer disk system manufacturer — at any price!

Features: 1-, 2- and 3-drive systems in 40- and 77-track versions store 102K- to 591K-bytes of random access data on-line • controllers include explicit clock/data separation circuit, motor inactivity time-out cir-

cuit, buffered control lines and other mature design concepts • ROM DOS included with SS-50 bus version — optional DOSs for EXORciser* bus • extra PROM sockets on-board • EXORciser* bus version has 1K-byte RAM • supported by extended disk operating systems; assemblers and other program development/debugging aids; BASIC, FORTRAN, Pascal and SPL/M languages; and, business application programs.



EXORciser* Bus LFD-400EX™ -800EX™ Systems



The SBC/9™. A "10" By Any Measure. ✓ 13

The Percom SBC/9™ is an SS-50 bus compatible, stand-alone Single Board Computer. Configured for the 6809 microprocessor, the SBC/9™ also accommodates a 6802 without any modification. You can have state-of-the-art capability of the '09. Or put to work the enormous selection of 6800-coded programs that run on the '02.

The SBC/9™ includes PSYMON™, an easily extended 1-Kbyte ROM OS. Other features include:

- Total compatibility with the SS-50 bus. Requires no changes to the motherboard, memory or I/O.
- Serial port includes bit-rate generator. RS-232-C compatible with optional subminiature 'D' connector installed. 10-pin Molex connector provided.
- Eight-bit, non-latched, bidirectional parallel port is multi-address extension of system bus. Spans a 30-address field; accommodates an exceptional variety of peripheral devices. Connector is optional.
- Includes 1-Kbyte of static RAM.
- Costs only \$199.95 with PSYMON™ and comprehensive users manual that includes source listing of PSYMON™.

™ trademark of Percom Data Company, Inc.
* trademark of the Motorola Corporation.

Prices and specifications subject to change without notice.

Versatile Mother Board, Full-Feature Prototyping Boards ✓ 15

Printed wiring is easily soldered tin-lead plating. Substrates are glass-epoxy. Prototyping cards provide for power regulators and distributed capacitor bypassing, accommodate 14-, 16-, 24- and 40-pin DIP sockets. Prototyping boards include bus connectors, other connectors and sockets are optional.

MOTHERBOARD — accommodates five SS-50 bus cards, and may itself be

plugged into an SS-50 bus. Features wide-trace conductors. Price: \$21.95

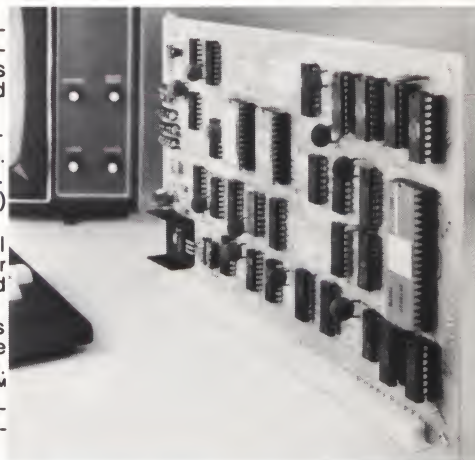
SS-50 BUS CARD — accommodates 34- and 50-pin ribbon connectors on top edge, 10-pin Molex connector on side edge. Price: \$24.95.

SS-30 BUS CARD — 1¼-inch higher than SWTP I/O card, accommodates 34-pin ribbon connector and 12-pin Molex connector on top edge. Price: \$14.95.

The Electric Window™: Instant, Real-Time Video Display Control ✓ 16

Memory residency and outstanding software control of display format and characters make this SS-50 bus VDC card an exceptional value at only \$249.95. Other features:

- Generates 128 characters including all ASCII displayable characters plus selected Greek letters and other special symbols.
- Well-formed, easy-to-read 7x12-dot characters. True baseline descenders.
- Character-store (display) memory included on card.
- Provision for optional character generator EPROM for user defined symbols.
- Comprehensive users manual includes source listing of Driver software. Driver — called WINDEX™ — is also available on mini-diskette through the Percom Users Group.



PERCOM

PERCOM DATA COMPANY, INC.
211 N. KIRBY GARLAND, TEXAS 75042
(214) 272-3421

Products are available at Percom dealers nationwide. Call toll-free, 1-800-527-1592, for the address of your nearest dealer, or to order direct.

SUPER BRAIN QDTM

Once in a great while someone comes along with a simple improvement for an already great product. Take our SuperBrain, for example. Really a simple concept. A high-powered, low cost micro-computer packaged in an attractive desk top cabinet. So how do you improve on that?

WE DID IT...

It wasn't enough that our SuperBrain had such standard features as twin double density 5¼" drives with over 300,000 bytes of disk storage. A full 32K of dynamic RAM - expandable to 64K in seconds. A CP/M* Disk Operating System which assures compatibility to literally hundreds of application packages presently available. A crisp, 12" non-glare screen with a full 24 line by 80 column display. A full ASCII keyboard with a separate keypad and individual cursor control keys. Twin RS232C serial ports for fast and easy connection to a modem and/or a printer. And, dual Z80 processors which operate at 4 MHz to insure lightning-fast program execution. No, it wasn't enough. So we made it better.

ANNOUNCING SUPERBRAIN QD...

Our new QD model has all of the features of our phenomenally popular SuperBrain with the addition of double-sided disk drives and an extra 32K of dynamic RAM. So, for only a modest increase in price, you can order your next SuperBrain *with more than twice the disk and memory storage capability*. But, best of all, the new QD model has the same tough, rugged construction and exceptional quality that made our SuperBrain such a success.



HOW DID WE DO IT?

The secret of SuperBrain QD's incredible disk storage lies within our new double-density double-sided disk drives. A total of nearly 720,000 bytes of data are formatted on two specially designed 5¼" drives. And that's more than enough to get you started with most serious small business applications. And SuperBrain QD's standard 64K of dynamic RAM will handle even the most complicated programming tasks.

Of course, if you're into megabytes instead of kilobytes, you may think neither SuperBrain is right for you. Not so! Intertec offers 20-96 megabytes of hard-disk storage which connects in seconds to either the SuperBrain or SuperBrain QD. So, your original investment is always protected. As you grow. No matter how much your needs expand.

BUT IS IT RELIABLE?

Our best salesmen are our present users. Not only have SuperBrain users been impressed with the inherent reliability of the system, they tell us that no other microcomputer system available today offers such a unique modular design concept. Just about the only tool required to easily

maintain the system is a common screwdriver. And Intertec's total commitment to product service and customer support, with service outlets in most major cities, insures your original investment will be a valuable one for many years to come.

THE DECISION IS YOURS.

Whether your next SuperBrain is a regular model or our QD version, you will have the satisfaction of knowing you purchased what is becoming one of the world's most popular micro-computer systems. And regardless of which model you choose, you'll probably never outgrow it because you can keep expanding it.

So, call or write us today for more information. Intertec systems are distributed worldwide and may be available in your area now.

**INTERTEC
DATA
SYSTEMS[®]**

2300 Broad River Rd., Columbia, SC 29210
(803) 798-9100 TWX: 810-666-2115

✓ 196



QUALITY

THAT'S WHAT SEPARATES THIS PRINTER FROM THE TOYS



MICROTEK MT-80

SOLID VALUE FOR YOUR DOLLAR

The market is flooded with low-cost printers that look and last more like toys.

The Microtek MT-80, our versatile alpha-numeric line printer, has a high quality print mechanism that gives you solid value for your dollar. It has been designed with a superior brain resulting in more advanced features and more dependable performance. Our printer is so reliable that we offer you an incredible 365 days warranty.

We stand behind every printer we make because we build quality into each one. So stop tinkering with toys and get serious. Demand 100% value by specifying the MT-80.

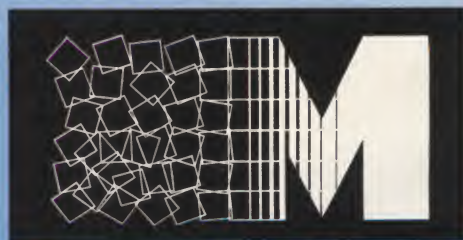
OUR UNIT PRICE

\$795 Parallel

\$895 Serial (RS-232C)

LOADED WITH INNOVATIONS

- 40, 80 or 120 columns (software selectable)
- Non-thermal paper, pin feed
- 125 CPS, 70 lines per minute
- 9 x 7 dot matrix
- Vertical format unit
- 96-character ASCII (upper and lower case)
- Adjustable forms width to 9 1/2"
- Parallel and serial (RS-232C) interfaces available



MICROTEK inc.

✓ 347

For more information contact:

MICROTEK, Inc.,
9514 Chesapeake Drive,
San Diego, CA 92123
Tel.(714)278-0633
TWX 910-335-1269

ARTICLES

- 26 **The 16-Bit Super Processors Are Here** The 8086, Z8000 and MC68000. *Martin Moore*
- 34 **Micro-Matrimony** The Sol 20 gets hooked. *Frank J. Derfler, Jr.*
- 36 **Winning the Micro Game** Learn the rules. *Don Lancaster*
- 40 **Improving the OSI Challenger C2** First of two parts. *Ugo V. Ré*
- 48 **Back-Space Mod** For CP/M and Microsoft BASIC. *Rod Hallen*
- 52 **Level II BASIC on a Z-80 System** Using Radio Shack ROMs. *Richard J. Uschold*
- 68 **64K Memory for the H8** Last month's article continues. *Myron J. Seibold*
- 76 **On Time and Space** A savings for North Star users. *Dr. David J. Yates*
- 84 **Why Do You Need Two Disks?** You'll know after reading this article. *James W. Stutsman*
- 88 **Disassembler for the Heath H8** Adaptable to other 8080/8085 systems. *Patrick Swayne*
- 96 **PET I/O Port Expander** Part 3 describes joystick interfacing. *William F. Pytlik*
- 100 **Slaying the 80-Column Dragon** Good news for Apple II users. *Michael S. Tomczyk*
- 106 **Graphics Character Generator** Mix text and graphics. *Robin B. Moore*
- 119 **The SWTP Computer System** A look at the HUMBUG monitor. *Peter A. Stark*
- 126 **Dial-up Directory** How to lower your computer phone bill. *Frank J. Derfler, Jr.*
- 130 **Designing Your Power Supply** PET earns its keep. *William R. Moore*
- 134 **Get Your PET on the IEEE 488 Bus** Part 2 examines files. *Gregory Yob*
- 143 **Some Tips on Program Conversion** Using a bookkeeping program. *Linda E. Bjelland*
- 148 **The Telltale UART** This should never happen to you. *Brian Stroehlein*
- 154 **Q & A on Printers and Terminals** What every bargain-hunter should know. *David Price*
- 158 **Integer Choice Game** Test your skills against Compucolor. *David B. Suits*
- 162 **Memory-Checking Program for the 1802** Sniffs out defective chips. *John R. Bunn*
- 165 **Chaining Data with the Sorcerer** Solution to information-savings deficiencies. *Charles Dailey*
- 168 **A "Personable" Calendar** Organize lists with PET. *G. R. Boynton*
- 174 **Recover That Lost Disk BASIC Program** A trick for the TRS-80. *Louise H. Frankenberg*
- 176 **CP/M Is for Me** A solution to mass storage. *Ken Barbier*
- 180 **Some Notes on Termination** Avoid those frustrating glitches. *Reo W. Pratt*
- 182 **Fastfind** Search large arrays in a hurry. *Bill Roch*
- 186 **TRSpeed-up Revisited** Change speeds on the fly. *Roy A. McCoy*
- 190 **File Dump for FLEX** Know your disk files. *Phil Hughes*
- 194 **Build a Breakout Box** For that extra parallel I/O port. *Don Walters*
- 198 **BASIC Programming Tips** Efficiency and fast program development. *Alfred E. Williams*
- 200 **Program Patching** For I/O flexibility. *Ken Barbier*
- 204 **CT-1024 Terminal Modifications** Improve cursor control and add a clock. *Fred Cooley*

DEPARTMENTS

Publisher's Remarks — 6
 Output from Instant Software, Inc. — 8
 Book Reviews — 8
 New Products — 12
 New Software — 16
 New Publications — 17
 PET-pourri — 20

Computer Clinic — 21
 Letters to the Editor — 22
 Micro-Scope — 208
 Calendar — 210
 Classifieds — 212
 Corrections — 212
 Dealer Directory — 220

Cover illustration by Dion Owens.

micro info

§ This symbol next to a title in the table of contents indicates that the article is a business-application article.

Manuscripts

Contributions in the form of manuscripts with drawings and/or photographs are welcome and will be considered for possible publication. We can assume no responsibility for loss or damage to any material. Please enclose a self-addressed, stamped envelope with each submission. Payment for the use of any unsolicited material will be made upon acceptance. All contributions should be directed to the *Microcomputing* editorial offices. "How to Write for Microcomputing" guidelines are available upon request.

Editorial Offices:

Pine Street
 Peterborough NH 03458
 Phone: 603-924-3873

Advertising Offices:

Elm Street
 Peterborough NH 03458
 Phone: 603-924-7138

Circulation Offices:

Elm Street
 Peterborough NH 03458
 Phone: 603-924-7296

To subscribe, renew or change an address:

Write to *Microcomputing*, Subscription Department, PO Box 997, Farmingdale NY 11737. For renewals and changes of address, include the address label from your most recent issue of *Microcomputing*. For gift subscriptions, include your name and address as well as those of gift recipients. Postmaster: Send form #3579 to *Microcomputing*, Subscription Services, PO Box 997, Farmingdale NY 11737.

Subscription problem or question:

Write to *Microcomputing*, Subscription Department, PO Box 997, Farmingdale NY 11737. Please include an address label.

Kilobaud *Microcomputing* (ISSN 0192-4575) is published monthly by 1001001, Inc., 80 Pine St., Peterborough NH 03458. Subscription rates in U.S. are \$25 for one year and \$53 for three years. In Canada: \$27 for one year only, U.S. funds. Foreign subscriptions (surface mail) — \$35 for one year only, U.S. funds. Foreign air mail subscriptions — \$62 for one year only, U.S. funds. In Europe, contact: Monika Nedela, Markstr. 3, D-7778 Markdorf, W. Germany. South African Distributor: KB Microcomputing, PO Box 782815, Sandton, South Africa 2146. Australian Distributor: Electronic Concepts, Attention: Rudi Hoess, 55 Clarence Street, Sydney 2000, Australia. Second-class postage paid at Peterborough NH 03458 and at additional mailing offices. Phone: 603-924-3873. Entire contents copyright 1980 by 1001001, Inc. No part of this publication may be reprinted or otherwise reproduced without written permission from the publisher.

PUBLISHER'S REMARKS

Keyboarding Economy

The postal service reportedly poured millions of dollars down the tubes trying to invent the uninventable: a machine for deciphering handwriting. Unquestionably there is a need for this.

Most of the data input to computers consists mainly of names, addresses and orders for goods. There seems to be no practical approach to induce people to buy a typewriter with a special ball that can be read by optical character-reading (OCR) systems. The postal service might be able to implement some sort of OCR addressing if they set up a special class of mail with lower rates for letters addressed with a standard OCR.

The answer to speeding up (cutting the cost) of data input for computers lies in some sort of automatic reading of names, addresses and other simple data such as quantity and part number for orders. We already have equipment that reads pencil or pen marks on cards, so that gives us something to work with. Since there are too many ways of writing or printing for a computer to cope with, we are going to have to come up with some simplified coding which our computers can read, but which can be marked with a pencil or pen.

There are about 40 different characters that need to be deciphered (alphabet, numerals, punctuation marks). A system that required you to choose each individual character from a group of 40 boxes, each box representing one character, would be too cumbersome. Since a name and address would have to allow for up to 80 individual characters, a coded card would have to contain 3200 boxes just to cope with the name and address. Something simpler is necessary, and I think I have a solution.

Most of my flashes of intuition come while I am taking a shower. (I've read that this has something to do with the negative ions caused by the stream of water hitting the body. There may be something to this. I don't take long showers, either—though I suppose I should. I've worked my morning shower process into an efficient system: brushing my teeth (yes, in the shower, while the beard is softening), shaving (yes, also in the shower, while the beard is soft and very easy to shave), soaping and rinsing. The whole works takes under ten minutes, including toweling, applying after-shave and

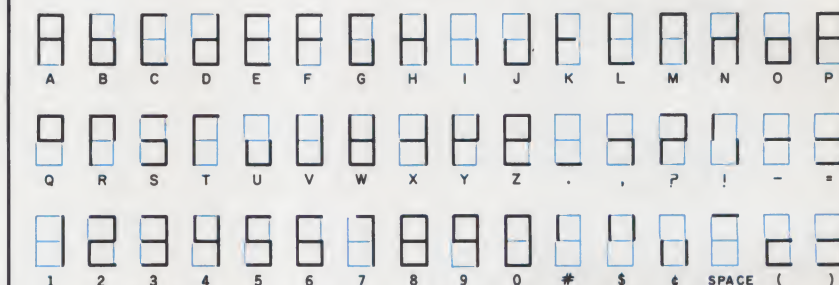


Fig. 4. This is the entire alphabet, numbers and some punctuation in the Green Readable Character set. This uses just the seven-segment readouts.

antiperspirant and combing what's left of my hair. If I save only ten minutes a day with this routine, it gives me 60 hours a year to do more productive things.)

This time the brainstorm had to do with utilizing the seven-segment LED or LCD character for an OCR system. With seven segments we should be able to represent 2⁷ characters, or 128. That's plenty for the alphabet, numbers and punctuation.

Should we go to an ASCII-type coding or start over again? Since lookup tables for electronic circuits are so simple, the coding should be easy to read. If we start with the ten numbers, which are all handled easily with the seven-segment system, we are off and running (see Fig. 1). The alphabet is more difficult, but let's look at the letters that are easy to handle first: A, C, E, F, G, H, J, L and P (see Fig. 2).

Some letters, such as a lowercase b and d, can be handled without too much strain. Half-sized i, o and u finish off the vowels, so they are all readable (see Fig. 3). I tackled the rest of the letters and punctuation, and I came up with Fig. 4.

To see if this was worth the trouble, I tried a few words in this new representational alphabet (see Fig. 5). It's a bit of a strain, but I think that a data-input person could become accustomed to reading this in a day or less.

The end result would be one seven-segment box for each character. A translation for the marks would not take up a lot of room on a coded order card, and the finished product could then be read by machine. This would cut

the cost of data entry, and thus make it possible to sell products or subscriptions cheaper. Remember that many data-input systems call for each name and address to be keyboarded a second time for verification, so perhaps you can appreciate the savings.

If those savings are not apparent, then look at it this way. At one minute per order for data entry, plus a second minute for verification of the original data, we're looking at around 14¢ in data-entry costs just for labor. Add the cost of the equipment, worker benefits, heat, light, power, repairs, training and supervision, and you at least double your cost of labor, bringing the data input cost up to 28¢ per order. Wouldn't you like to save 28¢ on every subscription to a magazine you send in . . . on every mail order you send in? An outfit that handled 1000 orders a day could save \$280 per day by changing to GRC (Green Readable Character) data input. That's over \$70,000 a year.

With this GRC system, a mail-order house or subscription agency would only need two data-input people. One person would take a quick look at each data input to make sure it was not screwed up; a second person would input those orders too badly confused for the system.

I doubt if this system would put a lot of people out of work. Most data-input departments I've seen are chronically short of people—not many employees enjoy sitting at a tube all day long typing in orders or reader-service requests.

This system should also be adaptable to post-office tasks. The first readers would be for



Fig. 1. Green Readable Character numbers. These are almost identical to standard seven-segment readouts.



Fig. 2. Some of the letters of the alphabet adapt to being easily read in seven-segment readouts.



Fig. 3. The vowels can be made simple to read.



Fig. 5. With a few minutes' practice almost anyone can read this character set. It isn't great, but it is handy.

In. Last name Call
 Business name, if to a business
 Address
 City or town State Zip

Fig. 6. This address block can accommodate a ham subscription or, by changing the call letter block to a business title, a business subscription to a magazine or on an order form. If substantial foreign business is expected, this will have to be modified to handle the zip code systems and allow a place to indicate the country.

postcard-size cards with an optically readable synchronizing line for the system to use as a reference to start reading the name, address, city, state, zip and other order information. That machinery would adapt to read addresses on envelopes and automate letter mail.

Light green outlines for the characters could be printed on the envelopes or on the labels to stick on the envelopes. Characters would be marked by pencil or pen over the green guide-lines. If the postal office used reader-sorters, they could drop the postage rate to maybe 10¢ for GRC mail, and soon every business in the country would use it, complete with GRC balls for typewriters.

Using the size and spacing of the IBM Selectric typewriter, a complete name and address could fit in an area 2½ inches long by 1 inch high, and that would provide three lines of 25 characters each. A four line address system would be 1½ inches high. That's within the size requirements for presently used labels, so the system should not be particularly difficult to put into operation.

A character reading system such as this could be adapted to any computer, either by use of a chip with the lookup table in it or a simple lookup software program. An operator watching cards being read would see the characters translated into regular terminal characters rather than seven-segment readouts.

The character reader could either scan a row of characters, reading them sequentially, or have 875 sensing elements to read the four 25-character lines at one time. Another element or two could detect synch indicators. Order-reading systems would probably scan more like bar-code systems.

The standard I have set for the system is ten characters to the inch and a pitch of two points per line (⅓ inch). The character blocks are ten point in size and can be approximated by using the IBM #10 Orator ball and typing an E over-

printed with an H. This leaves a line beneath each character line for indicating what should be on that line.

Hitachi and Tandy Coming?

There are hints that Hitachi is releasing a new system that could sell well in this country. I understand that it has eight colors and a 640 × 200 resolution. It uses a 6809 processor.

We're still waiting for the release of the Tandy color system, rumored to be called TRS-90 and use a Z-80. Although Tandy had plans for using the 6809, I suspect that the importance of being able to use the already developed program base had some effect on the decision. One of these days, we'll see where rumor ends and facts begin.

The first evaluation units of the Hitachi system should arrive in this country by early fall. I think we're in line to look at a system, so watch for more news.

Winchester Technology

This term is used a lot these days, and I'll bet that few readers have any idea of its origin. It all started, according to a recent Pertec newsletter, with a 1973 IBM 3340 drive. This new disk development was supposed to be a dual 30 megabyte drive: 30-30. The drives eventually became 35 and then 70 megabytes each, but by then the "Winchester" name had stuck. So much for the history lesson for today.

(continued on page 218)

kilobaud

MICROCOMPUTING T.M.

PUBLISHER/EDITOR
Wayne Green

ASSISTANT PUBLISHER/EDITOR
Jeffrey DeTray

MANAGING EDITOR
John Barry

EDITORIAL ASSISTANTS
Dennis Brisson
Susan Gross
Eric Maloney

ASSOCIATE EDITORS
Frank Derfler, Jr.
Rod Hallen
Peter Stark
Sherrn Wantz

PRODUCTION DEPARTMENT
MANAGER:
Noel Self

ASSISTANT MANAGER:
Robin Sloan

STAFF:
Steve Baldwin
Tedd Cluff
Linda Drew
Robert Drew
Bruce Hedin
Kenneth Jackson
Ross Kenyon
Clare McCarthy
Michael Murphy
Dion Owens
Robert Sawyer
Patrice Scribner
Diana Shonk
Susan Symonds
John White

PHOTOGRAPHY
William Heydolph
Terrie Anderson
Reese Fowler

TYPESETTING
Barbara Latti
Sara Bedell
Janet Cote
Mary Kinzel
Linda Locke
Karen Podzyski

PROJECTS EDITOR
Jim Perry

BOOK EDITORS
Chris Brown
Emily Gibbs

EXECUTIVE VICE PRESIDENT
Sherry Smythe

CORPORATE CONTROLLER
Alan Thulander

EXECUTIVE ASSISTANT
Leatrice O'Neil

ACCOUNTING MANAGER
Knud Keller

CIRCULATION MANAGER
Debra Boudrieau

CIRCULATION
Barbara Block
Pauline Johnstone

BULK SALES MANAGER
Ginnie Boudrieau

AUSTRALIAN DISTRIBUTOR
Rudi Hoess

EUROPEAN MARKETING DIR.
Reinhard Nedela

ADVERTISING
603-924-7138

Kevin Rushalko, Mgr.
Marcia Stone
Penny Brooks
Jerry Merrifield
Hal Stephens

OUTPUT FROM ISI

Program Search

Exidy's acquisition by Recorder should increase demand for program packages for this system. ISI is particularly interested in Exidy-oriented programs for possible publication. If you have both a TRS-80 and an Exidy, you might like to try translating programs from one system to the other—for a royalty on the sales.

North Star is doing well, and ISI has North Star-based program packages well along in development . . . and needs more. If you have written any good North Star programs, you can help both North Star and yourself by submitting them for possible publication.

It will be quite a while before we have a serious need for Apple III programs, but the ISI programs currently distributed for the Apple are faring well and are a nice source of income for the authors. Now that ISI has a good foundation of TRS-80 programs, more time is

being invested in the support of the Apple and other systems, so turn your Apple programming work into royalty income.

We also need a machine-language word processor—particularly for the TRS-80. This would speed up the system and make such a use for the TRS-80 far more practical. How about it, all you machine-language fans?

Translators Needed

Pressure is being put on microcomputer manufacturers to provide software support for their systems: some of the majors are beginning to feel the heat. Dealers are complaining, and even the general-interest magazines are mentioning poor software support. Money magazine quoted Texas Instruments as having plans for only 100 programs by the end of 1981. This tiny number has to put a chill on the whole in-

dustry.

It seemed appropriate for Instant Software to help by putting some TI programs on the market. We consulted our associate-editor list to see who had volunteered to make the conversions from the TRS-80 to the TI-99/4. With over 1,000 editors from which to choose, we could find none available for this job!

Readers who want to tackle this should write and give me some idea of their equipment and experience. We have released hundreds of programs for the TRS-80; we want to translate as many as possible for use on the TI-99/4. We understand the problems with the system and the efforts Texas Instruments made to make translations difficult.

Several other firms have shown interest in getting substantial software support, so we may need translators for programs from TRS-80 to Heath, Atari, Apple and a few others. You do the work on your time, at your convenience. If you think you might go for this, drop me a line.

BOOK REVIEWS

Electronic Design with Off-the-Shelf Integrated Circuits

Z. H. Meiksin and Philip C. Thackray
Parker, West Nyack, NY, 1980
Hardbound, 383 pp., \$19.95

This cookbook contains the design principles you'll need to exploit low-cost mass-produced integrated circuits and passive support components. An excellent one-stop reference for the computerist who designs his own hardware, the book is for both those who are only adding to their systems and those who are full-blown construction freaks.

The text focuses on practical approaches. It minimizes math and emphasizes a cut-to-fit method that must, in the end, be applied to the most thoroughly planned designs.

For example, the book supplies simplified equations for designing active filters with op amps. It covers first through fourth order, constant ripple, maximally flat and high-Q filters. Even with the simplified tables and equations provided, the authors say, values

that result are "of much greater precision than can be obtained with commercial fixed value components." The text then outlines filter tuning procedures.

While most readers will use the sections on digital ICs primarily for reference, topics such as rise time and decay time are presented in an unusually lucid manner. The chapters on analog to digital conversion, linear applications and nonlinear applications are also thought-provoking. These chapters cover photo sensor amplifiers, four-quadrant multipliers, peak detectors and sample and hold circuits.

The book, unlike any other text I've seen, covers passive components with the same depth it covers active components. These include resistors, capacitors, inductors and transformers.

This information will help you decide what type or composition of capacitor to use or what type of resistor you'll need. The characteristics of each type of part are explained with enough detail to let you make intelligent decisions.

The authors also discuss techniques for an-

ticipating and eliminating noise problems. Computer buffs will be particularly interested in the chapter on grounding and shielding. A section on eliminating spurious signals in digital circuits includes ways to handle power supply noise, stray field effects, capacitive coupling and signal reflection. The chapter also suggests ways to overcome problems with analog and hybrid digital-analog systems.

The text ends with examples of system design and summarizes considerations that affect the overall performance of a system. The book provides guidelines for choosing the IC functional blocks that best satisfy an application's requirements with the greatest cost-efficiency.

"Pitfalls to Avoid," a feature of each section, has already earned the price of the book for me. It covers common errors in the design approach to applying the particular component. For example, the authors point out a common error in the design of light detector amplifiers and suggest an approach that eliminates the problem and reduces the circuit's part count.

While much of the book's information is

duplicated elsewhere in my library, nowhere is it so conveniently brought together. I think that if you have any experience with building or designing hardware, you'll find this a useful text that is neither too complicated nor too simple.

Gregg W. Squires
Sparkill, NY

Microcomputer Interfacing

Bruce A. Artwick
Prentice-Hall, Englewood Cliffs, NJ
Hardbound, 323 pp., \$18.95

The title of this book led me to believe that it would discuss how to attach peripherals or signal conditioners to a functioning computer system. But it instead tackled such topics as selection of microprocessor chips, design rules for microprocessor controllers and construction techniques. Artwick is clearly talking about microprocessor interfacing.

If you're a hobbyist ready to become an entrepreneur, your first decision will be which microprocessor to choose. Four, eight or 16 bits? High speed or low power? One whose instruction set is directed toward data processing or industrial control? Artwick compares about a dozen different microprocessors. He is uneven, but does touch on the weaknesses and strengths of each. He also includes bit-sliced chips and single board controllers. Novice designers will find this helpful.

Because of its clear explanation of both static and dynamic RAM, the chapter on data storage is the best in the book. Imagine someone boiling down volumes of manufacturers' literature and making the residue readable. Starting with the old 2102 memory chip and using many simplified block and timing diagrams, he works his way through to the recent dynamic 4 and 16K RAMs. The text answers such questions as "Why do the new dynamic 16K RAMs have fewer address pins than 1K static RAMs?" and "What is the difference between an erasable PROM and an alterable ROM?" It even looks briefly at charge-coupled devices and magnetic bubble memory.

About one quarter of the chapter deals with magnetic recording methods for long-term storage on tape or floppy disks. Hard disk technology is ignored.

The chapter on interfacing components also deserves special mention for its completeness. Any possible way to get information into or out of a computer system is listed. Artwick covers the basics of TTL drivers and receivers and explains the importance of fan-out, what to do about unused gate inputs and how to mix MOS and TTL family chips in the same design. This is followed by the LSI interface chips, such as programmable peripheral interface chips and CRT controllers.

A good section explains why a synchronous communication interface adapter is more complicated than an asynchronous communication interface adapter. The pages on analog and digital conversion, transducers and optical displays contain many practical suggestions and criteria for selection.

Each topic, however, is limited in scope. A

section on floppy disk controller chips mentions two that are designed to mate with specific microprocessors but neglects to mention the Western Digital 1790 series, which is manufactured for use with any microprocessor.

The rest of the text is more general. The chapter on input and output methods spends less than a page each on asynchronous serial communications, multiplexing and memory-mapped I/O and doesn't include examples. Artwick's coverage of polling and interrupt-driven I/O is a bit more comprehensive, because he offers suggestions on how to assign interrupt priorities and handle interrupt processing.

Other chapters cover circuit board layout, construction techniques and interfacing to standard microcomputer buses.

Artwick does not include a bibliography. This is unfortunate, since I found many places where I needed more information. The figures are excellent and the majority of the text is very clear. The coverage of future trends in the industry will keep the book current long enough to avoid having to put out the second edition in loose-leaf form.

The overall usefulness of this book would depend on who you are. If you want to design something, *Microcomputer Interfacing* is just a starting point. It is not a circuit design reference book because not many specific circuits are included.

The book is good for hints, tips and rules. Here are two examples: "One-shots should never be used to drive Set, Clear or Clock inputs of logic devices," and "Convert analog signals into digital signals as soon as possible."

I doubt that an inexperienced designer would be able to complete an assignment with just this book, but it should shorten development time. The person who wants to know how microprocessor-based equipment works will be helped the most.

Mike Aronson
Oregon City, OR

Introduction to Computer Programming

Walter S. Brainerd
Charles H. Goldberg
Johnathan L. Gross
Harper and Row, New York, 1979
Hardcover, 534 pp., \$16.95

The authors promise a textbook that will give the beginner a solid foundation of programming knowledge. And though the title is a little misleading—the novice will need to know something about programming if he does not have an instructor—the book is one of the best treatments of the art and science of programming I have used.

The authors take a unique approach. They have developed a Beginner's Programming Language (BPL) that teaches the logic of programming without requiring the reader to master the conventions of a specialized language. The beginner can read and understand a BPL program without any knowledge of the

BPL rules; the language itself carries the structure of its own logic.

The beauty of this approach is the ease with which a student of BPL can transfer his learning to BASIC, FORTRAN, PL/1 and COBOL programming. Once the reader adjusts to BPL, the 200 sample programs found in the text are completely understandable.

The book moves from the simple to the complex, using examples and applications every step of the way. For example, a continuing analysis of credit card sorting presents an excellent tutorial of various sorting routines. The authors go through finding the smallest element in a list, sorting by replacement, merging, the bubble sort and, finally, file sorting.

As they present this material, the authors lead the reader through formatting, looping and other standard tools of programming. The beginner learns in a building-block fashion, each bit of knowledge leading to the next.

The beginning programmer should follow the text sequentially. However, a reader with a solid foundation in programming will want to study selected chapters. The 500-plus exercises throughout the book provide a constant source of stimulation and challenge.

James P. Morgan
Scott AFB, IL

NEW RELEASES

6502 Software Design—Leo J. Scanlon. Howard W. Sams & Co., Inc., Indianapolis, IN. \$10.50.

Programming with ADA: An Introduction by Means of Graduated Examples—Peter Wegner. Brown University, Providence, RI. \$13.95.

Programming & Interfacing the 6502—Marvin L. DeJong. Howard W. Sams & Co., Inc., Indianapolis, IN. \$13.95.

Microprocessors/Microcomputers/System Design—Texas Instruments, Inc. McGraw-Hill, New York. \$24.50.

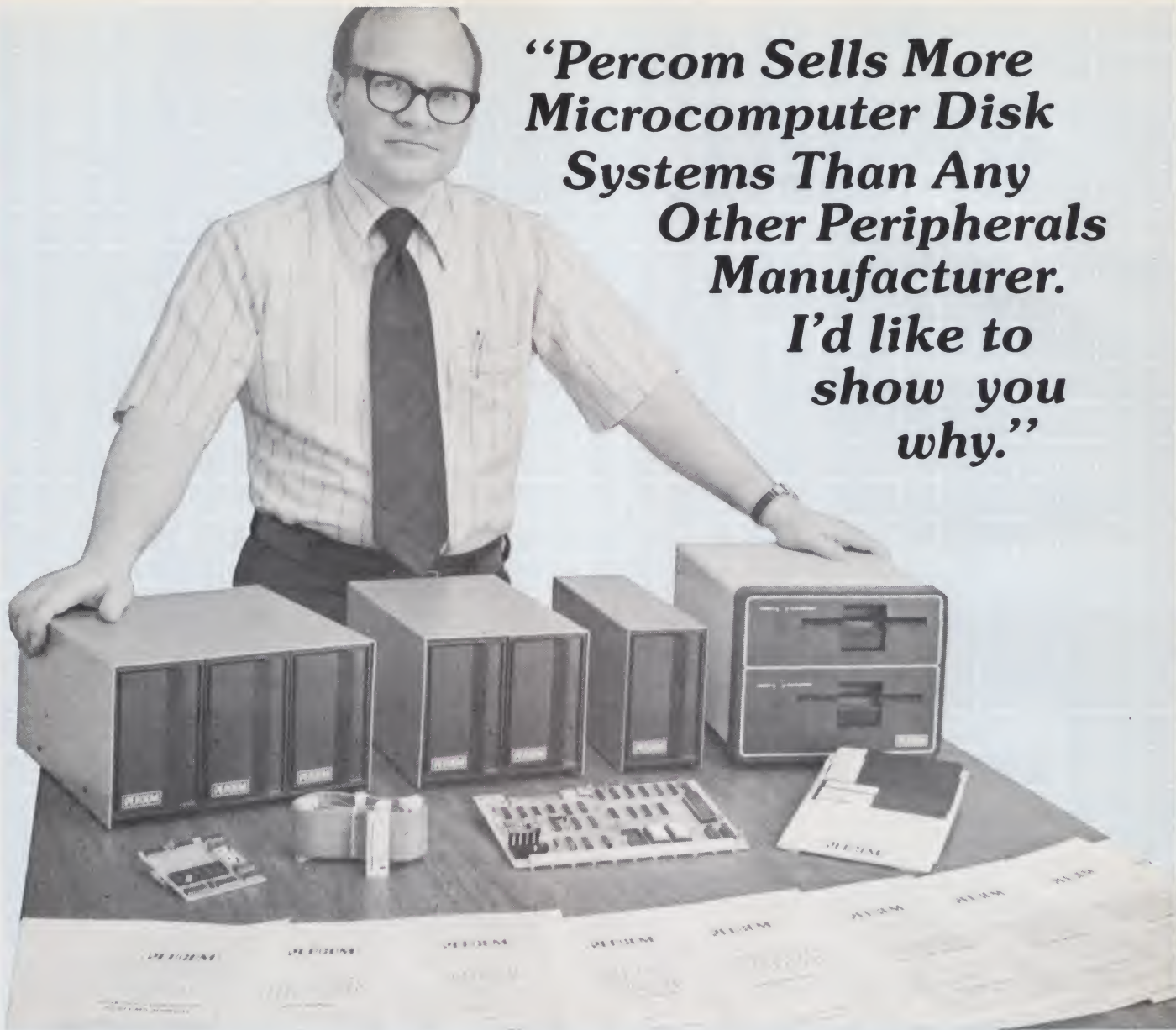
The Howard W. Sams Crash Course in Microcomputers—Louis E. Frenzel, Jr. Howard W. Sams & Co., Inc., Indianapolis, IN. \$17.50.

Troubleshooting Microprocessors and Digital Logic—Robert L. Goodman. TAB Books, Blue Ridge Summit, PA. \$12.95, hardbound (\$7.95, paperback).

Computer Consciousness: Surviving the Automated 80s—H. Dominic Covey and Neil H. McAlister. Addison-Wesley, Reading, MA. \$5.95.

A Bit of BASIC—Thomas A. Dwyer and Margot Critchfield. Addison-Wesley, Reading, MA. \$5.95.

Experimenter's Guide to Solid State Electronics Projects—Alfred W. Barber. Parker Publishing, W. Nyack, NY. \$14.95.



**“Percom Sells More
Microcomputer Disk
Systems Than Any
Other Peripherals
Manufacturer.
I’d like to
show you
why.”**

“Percom has been manufacturing mini-disk storage systems for microcomputers since 1977 when we introduced the 35-track, single-drive LFD-400™. Now we produce 1-, 2- and 3-drive systems in 40- and 77-track versions, a multi-density MEGABASE™ system and a host of accessories and software.

“Volume not only means experience in critical production and testing operations, it also means we can offer superior design features, extra testing and qualified backup support at very competitive prices.

“I know of no other microcomputer disk system manufacturer who even begins to offer the broad spectrum of disk equipment and programs available from Percom.”

“So before you buy a mini-disk system for your 6800, 6809 or TRS-80* computer, take a good look at what the people at Percom have to offer.”

Harold Mauch
President, Percom Data Company

Percom disk systems start at only \$399.00. Disk systems and other quality Percom products are available at computer dealers nationwide. **Call toll-free, 1-800-527-1592, for the locations of dealers in your area, or to order direct.**

✓ 17

PERCOM

PERCOM DATA COMPANY, INC.
211 N. KIRBY GARLAND, TEXAS 75042
(214) 272-3421

PRICES AND SPECIFICATIONS SUBJECT TO CHANGE WITHOUT NOTICE.
™ trademark of Percom Data Company, Inc.

*trademark of Tandy Radio Shack Corporation which has no relationship to Percom Data Company.

"From an efficient 1K-byte control system DOS to high level languages such as FORTRAN and Pascal, no other microcomputer disk systems manufacturer provides the range and quality of development and application programs available from Percom."



"Connie is running a 'cats eye' test on a mini-disk drive to check radial track alignment. Drive motor-speed timing and sensor alignment tests have already been performed. Disk formatting and format verification tests are next. These measurements are part of the 100% testing every single unit receives."

"Whether you call about a shipping date or ask a tough technical question, you get a competent courteous answer. Outstanding customer service is a hallmark of Percom."



"Richard's making final changes to a disk controller which will allow Percom drives to be used with yet another computer. We're constantly developing and introducing new products that extend and enhance the value of Percom systems."



"Slipping a circuit board through the eye of a needle would be easier than slipping a cold solder joint past Beverly. These are four-drive LFD-400/800 disk system controllers she's inspecting."



NEW PRODUCTS

Apple III

Apple Computer, Inc., 10260 Bandle Drive, Cupertino, CA 95014, has introduced its Apple III computer. Designed for use by professional/managerial personnel, the Apple III features a new Apple-designed central processor, up to 128K bytes of main memory, a built-in disk controller for handling up to four floppy disk drives, a new keyboard design with a 13-key numeric keyboard and an 80-character \times 24-line upper/lowercase display. A number of items that were optional on the Apple II have been incorporated as standard equipment in the Apple III. In addition, a special emulation capability lets users convert an Apple III to an Apple II to permit the use of programs developed for the Apple II.

Two new application packages are offered for use on the Apple III: the Information Analyst software, for planning, forecasting, modeling, pricing and costing, scheduling and budgeting, and the Apple III Word Processor software, for preparing memos, letters and general typing, long documents, form letters and legal documents. Apple III prices range from \$4340 to \$7800. Reader Service number 481.

Dot-Matrix Printer

The Model 460, the newest addition to the Paper Tiger line of dot-matrix printers, features bidirectional print speeds of 160 characters per second and offers correspondence-

quality, high-speed printing and high-resolution graphics. It offers a variety of programmable print control functions including proportional character spacing and automatic text justification.

The Model 460 can print in 80-, 96- and 132-column formats. Standard paper-handling features include adjustable pin-feed tractor drives that use a stepper motor to ensure fast, accurate movement of fanfold or roll paper and single- or multi-part forms ranging from 1.75 to 10 inches wide. A standard 2K byte buffer allows acceptance of the entire contents of a full 1920-character CRT screen. The unit has a standard RS-232C serial interface as well as a Centronics-compatible parallel interface. Serial transmission rates from 110 to 9600 baud are switch-selectable. Price is \$1295.

Integral Data Systems, Inc., 14 Tech Circle, Natick, MA 01760. Reader Service number 477.

TRS-80-Compatible Computer

Personal Micro Computers, Inc., 475 Ellis St., Mt. View, CA 94043, has introduced a new computer that is hardware- and software-compatible with the TRS-80. The PMC-80 features a cassette tape recorder, 16K memory, Level II Microsoft BASIC interpreter in ROM, power supply and keyboard in one cabinet. It will display on either a TV monitor or on a standard TV set using a built-in VHF channel 3 modulator.

All software available for the TRS-80 will operate in the PMC-80. All peripherals de-



The latest Paper Tiger series printer from IDS.

signed for the Radio Shack parallel port will interface to the PMC-80 50-pin bus through a 40-pin interface adapter available from PMC. Disk-based programs can be run on the PMC-80 using the Radio Shack Expansion Interface, or equivalent, which makes peripherals designed for the TRS-80 (such as Winchester disks, speech recognition, printers or RS-232 adapters) compatible with the PMC-80. Price is about \$200 less than a comparably equipped TRS-80. Reader Service number 476.

Hardware Debug Aid

New Technologies Co., PO Box 32, Streamwood, IL 60103, now offers an inexpensive al-

The Apple III.



The PMC-80.



ternative to logic analyzers and logic probes in troubleshooting micros. The Hardware Debug Aid (HDA) is an S-100 board that provides sync pulses for oscilloscope use in troubleshooting specific instructions. Or, you can disconnect the address bus to sync any combination of up to 17 signals by using jumpers. The sync pulse is also used to latch and display the status of up to eight TTL-level signals. Price is \$99.95 (\$84.95, kit). Reader Service number 473.

RS-232 Storage Device

The Micro-Sponge is a mass storage device that is jumper selectable for 300, 1200, 9600 and 76.8K baud and stores a maximum of 80K bytes on a 75-foot Exatron Stringy Floppy wafer. The unit plugs into any computer system that has an RS-232 port. Wafers come in five-foot increments of tape length from a minimum of five feet to a maximum of 75 feet, and each five-foot length of tape stores 5.3K of RS-232 formatted data.

The Micro-Sponge features four basic commands: Read, Write, Go to Beginning of Tape and Space File Forward. The Sponge buffers up to 1000 bytes of data in internal RAM before writing out to the wafer and requires 4.5 seconds to transfer 5.3K bytes at 9600 baud—24 seconds maximum to find the beginning of tape in an average length wafer. Price is \$349.50.

Exatron, 181 Commercial St., Sunnyvale, CA 94086. Reader Service number 471.

Variable Speed/Dot Density Printer

The Slimline SLG is a new graphics printer that provides a choice of two-speed/two-dot-density printing for alphanumerics. It will print routine reports at 400 lpm with a low-density pattern (7×5 and 7×6 matrices) and then switch to a high-density pattern (7×9 and 7×12 matrices) to print correspondence at 120 lpm.

In graphics mode, it provides a dot density of

Okidata's graphics printer.



Exatron's Micro-Sponge.

100×100 dots per inch at a plotting speed of 12 inches per minute. It will reproduce anything that can be displayed on a CRT screen, including graphs, maps, bar charts and labels, as well as such foreign language characters as Arabic, Chinese and Farsi. It is available with Printronix-, Centronics- and Dataproducts-compatible parallel interfaces and with a microprocessor-controlled RS-232 serial interface.

Okidata Corporation, 111 Gaither Drive, Mount Laurel, NJ 08054. Reader Service number 475.

H89 Disk Accessory

The H77 is a new floppy disk accessory for the H89 all-in-one computer. The H89 can accommodate up to three floppy disk drives with the H77. You can run operating system and program disks at the same time for fast and efficient access to programs and data.

Based on the H17 Floppy Disk System, the H77 uses standard 5.25-inch, hard-sectored 40-track diskettes, each of which is capable of storing 100K bytes of data. It uses the Siemens 82 disk drive system, which provides reliable high-speed access to data. Random sector ac-

cess time is less than 250 milliseconds. The H77 (\$595) includes one disk drive. A diskette storage accessory, which fits into the space reserved for the second drive, is also included. The H17-1 (\$325) is available to provide two-drive capability for the H77, giving the H89 a total of three drives including the drive built into the computer itself.

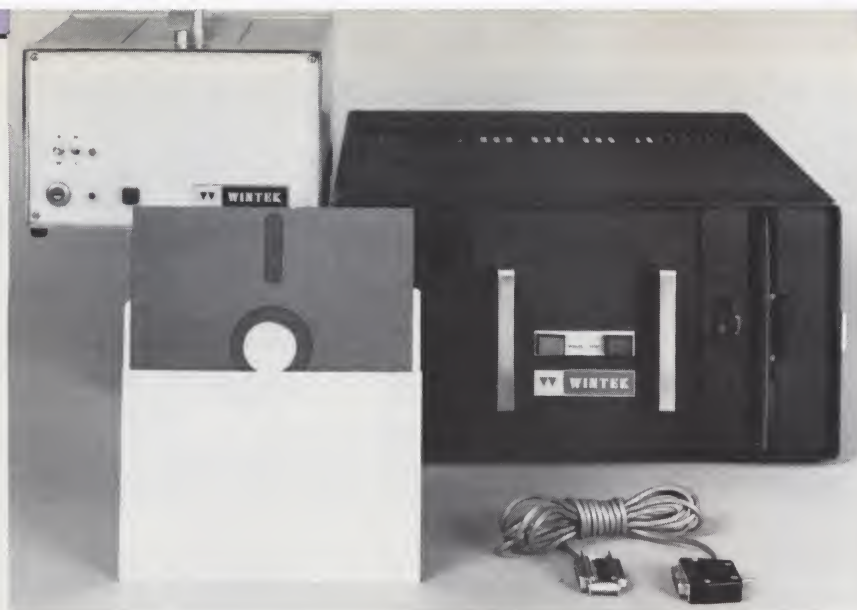
Heath Company, Benton Harbor, MI 49022. Reader Service number 483.

Single Board Computer

The ZCB single board computer, designed to function as the center of a unique approach to system design, is aimed at system integrators as well as the industrial process control and scientific markets. It generates all standard S-100 bus signals, including emulation of an 8080 CPU, and contains a Z-80-A operating at 4 MHz, 1K of high-speed static RAM memory, three sockets for up to 12K of PROM, one serial port and three 8-bit programmable parallel ports. Circuitry is provided to support static or dynamic memories. Use of 2708, 2716 or 2732 PROMs is jumper selectable, and the addressing of the PROM and RAM is completely variable. Use of wait states on bus cycle and/or in-

H77 Floppy Disk System.





Wintek's Down Loader system.

struction fetch cycle is also jumper selected.

The serial port makes use of the Intel 8251 USART, which enables software to control the format of the transmitted data and to vary the mode of transmission. A DIP switch specifies the basic rate, between 110 and 9600 baud. The parallel ports use the Intel 8255, which allows the same lines to be used for input and output, under program control, and allows flexibility in assigning lines to I/O addresses, also under program control. Price is \$395.

Vector Graphic, Inc., 31364 Via Colinas, Westlake Village, CA 91361. Reader Service number 480.

Microcomputer Down Loader

Wintek's new Down Loader allows you to automatically down-load programs developed on the Sprint 68 microcomputer to a target computer for final debugging in their true oper-

ating environment. The system consists of a switched RS-232 cable assembly and associated software on diskette. Price is \$149.

Wintek Corp., 1801 South St., Lafayette, IN 47904. Reader Service number 470.

Wire-Wrapping Tools

OK Machine and Tool Corp., 3455 Conner St., Bronx, NY 10475, announces several new tools and parts for prototype and hobby applications.

The WK-4B wire-wrapping kit includes a universal PC board, an edge connector with wire-wrapping terminals, two industrial-quality 14-pin wire-wrapping DIP sockets, two 16-pin sockets, a DIP inserter/extractor, a wire dispenser with 50 ft. of wire and a cutting and stripping mechanism to prepare the wire for wire-wrapping or soldering and a new combination tool that wraps and unwraps 30 AWG



The WK-4B wire-wrapping kit.

wire on .025 square pins, plus strips 30 AWG wire using a convenient built-in stripper. Price is \$25.99. Reader Service number 485.

Word Processor/Computer

Superstar is a word processor/small-business computer that consists of ITI's Superbrain by Intertec, the NEC Spinwriter and MicroPro's WordStar word-processing software. This combination features word wrapping, dynamic pagination, two double-density 5¼-inch floppy disk drives, 64K bytes of user-programmable RAM and printing at 55 cps. Price is \$7500. Software necessary to handle a company payroll of up to 75 people, general ledgers, accounts receivable and inventory is available for \$2500.

Information Technology, Inc., 56 Kearney Rd., Needham, MA 02194. Reader Service number 469.

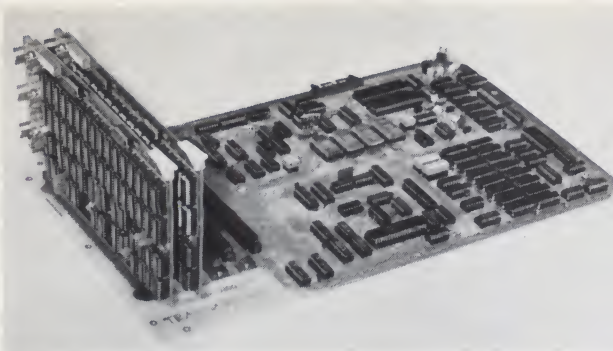
The Superstar combination.



Typewriter Interface

Now you can turn your electric typewriter into a hard-copy printer with the I/O Pak from Rochester Data, Inc., 3100 Monroe Ave., Rochester, NY 14618. This typewriter interface exploits the high quality and full upper and lowercase characters of electric typewriters, permitting users of small computer systems to expand those systems into applications demanding high-quality text, such as word processing.

The I/O Pak, consisting of an array of coils positioned in the same pattern as the typewriter's keyboard, fits directly over the keyboard. These coils are wired into an electrical decoding matrix. The unit is designed to operate on voltages available from standard computers; no modification to the typewriter is required. All adjustments to compensate for different



The Tuscan S-100.

key heights are incorporated in the I/O Pak. Interfaces and software are available for the TRS-80, Level I and II, and the Apple II. A 6-bit parallel interface for general operation with other computers is also available. Price is \$499. Reader Service number 479.

TRS-80/H14 Interface

Now you can interface your TRS-80 and the Heath H14 Serial Printer without having to load a software driver into memory each time the computer is powered up. The PTS-3 interface plugs into the parallel printer port of the Radio Shack Expansion Interface, and the H14 connects to the DB-25S connector of the PTS-3. The H14 baud rate switches are set for operation at 4800 baud. All handshaking and printer status signals are supported with this interface.

Once the PTS-3 is installed, the TRS-80 "thinks" it is connected to a Centronics-parallel-type printer. Compatibility is extended to support all printer commands whether at the BASIC level or machine-language level.

The PTS-4 interface can be used with the PTS-3 in systems that do not include the Radio Shack Expansion Interface. The PTS-4 simply connects to the 40-pin card edge located on the rear of the TRS-80 keyboard. The PTS-3 can then be connected to the PTS-4 to obtain printer operation, just as if an Expansion Interface were being used. The PTS-3 and PTS-4 each cost \$69.95, plus \$3.50, shipping and handling.

Multi Media Systems, PO Box 41084, Indianapolis, IN 46241. Reader Service number 478.

Britain's S-100 Microcomputer

The Tuscan is a newly designed Z-80 single board computer that is based on the S-100 bus. Billed as the first British S-100-based microcomputer, it utilizes widely available S-100 extension cards and comes with five S-100 cards laid flat on one board. It features versatile I/O capability with immediate expansion possibilities, including a disk-based CP/M system, high-resolution graphics and speech synthesis. Packaged in a professional case with integral disk drives, the unit is available in all options as a kit or fully assembled and tested.

Transam, 12 Chapel St., London, England NW1 5DH. Reader Service number 484.

H8 Prototype Board

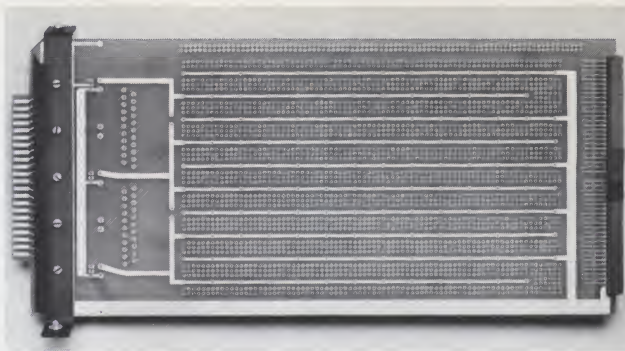
The HKB-1 prototype board for the H8 bus, designed for ease of external cable connection, is a full-sized FR-4 board with heat sink/mounting brackets, bus connectors and a polarizing key. It uses .042 inch diameter plated-through holes on .1 inch centers for use with wire-wrap pins or direct solder connections. It features a hole pattern with interlaced power and ground traces with built-in jumper locations available. Price is \$46, kit.

Mullen Computer Products, Inc., Box 6214, Hayward, CA 94545. Reader Service number 482.

Power Control Console

Spike-Spiker is a computer power control console that makes it convenient to plug all your computer equipment into one unit and switch the equipment on and off in the required sequential order. It eliminates constant plugging and unplugging of power cords. It also protects your computer from power line transients with an absorber and provides rf hash filtering between the computer and motorized

Kalglo's Spike-Spiker.



The HKB-1.

equipment. The console has eight individually switched 120 V ac outlets divided into two separate filtered circuits, main on/off switch, fuse and indicator light. Price is \$44.95.

Kalglo Electronics Company, Inc., Colony Drive Industrial Park, Box 2062, Bethlehem, PA 18001. Reader Service number 472.

TRS-80 Power Control Interface

The Black Box Energizer plugs into any Level II TRS-80 to control up to 256 separate appliances and lamps. A built-in timer measures time from seconds to days, with 1/60 second accuracy. Lamps can be dimmed and brightened under full program control. An exclusive fast-control mode is provided for special applications such as lighting displays. It is also suitable for industrial applications such as automatic irrigation, solar energy, security systems and manufacturing control.

This power control interface works with any appliance or lamp control module manufactured by BSR and sold separately by Sears and Radio Shack. It broadcasts control signals directly over your home's electrical wiring. A complete system requires only the energizer and one or more power control modules (sold separately). Price is \$49.95.

Oasis Systems, 2765 Reynard Way, San Diego, CA 92103. Reader Service number 474.

The Black Box Energizer from Oasis Systems.



NEW SOFTWARE

Computer Bismarck

Computer Bismarck is a simulation game modeled after the confrontation between the British and the German naval units at the outset of World War II. It transforms the simple Battleship game into a game of advanced strategy and planning. The luck element has been minimized, and skill, cunning and planning are the critical factors. I received two versions of the program for review: Apple disk and TRS-80 cassette.

The Apple disk is more entertaining because of its use of color graphics and the quick access to disk data that allows for faster play between the different program elements. The program consists of the setup, main program and combat program. The disk uses a single data file for all three parts and has auto load linking between the program elements.

The TRS-80 cassette version contains both 16K and 32K Level II. The 16K version is cumbersome to use. The setup program produces a data file on tape that has to be read by the main program for play to begin. Before engaging in combat, you must make a data file tape which is read by the combat program. Due to memory restrictions, each program section has to be loaded separately and run individually. The 32K version has the main and combat program elements combined, so it will play much easier and quicker than the 16K version. I would like to see a 48K disk version for the TRS-80. Apple disk version is \$59.95; TRS-80 cassette version is \$49.95.

Strategic Simulations, Inc., 450 San Antonio Rd., Suite 62, Palo Alto, CA 94306. Reader Service number 489.

Ed Umlor
Technical Dept., ISI

COBOL-80 Compiler

Microsoft, 10800 NE 8th, Suite 819, Bellevue, WA 98004, announces version 4.0 of its COBOL-80 compiler for 8080-, 8085- and Z-80-based microcomputers. New features include: full-screen interactive Accept/Display and Screen Section compatible with Data General Interactive COBOL, Chain with argument passing and Segmentation to ANSI standard Level I. This new version exceeds ANSI-74 requirements with full implementation of Level I, as well as many Level II features. COBOL-80's advanced features—full Copy facility, trace style debugging and ASCII, packed and binary data formats—maximize microcomputer utility.

It supports all existing versions of CP/M, in-

cluding 1.3, 1.4 and 2.X for files up to 8 megabytes. It runs under CP/M, ISIS-II, IMDOS, CDOS, TEI's TDOS and Model II TRSDOS operating systems; it can be easily adapted to other operating systems. Price is \$750; documentation may be purchased separately for \$20. Reader Service number 486.

TRS-80 Software

Simulation Software, PO Box 1368, Warren, MI 48090, announces the release of two programs for TRS-80s equipped with Level II BASIC and 16K RAM.

Dungeon Explorer 2.0 is a single-player game of combat and adventure in which a player tries to become a superhero by battling monsters within the Dungeon of Xanadu. This revised version features a streamlined game command input routine (using INKEY\$), improved combat sequences, additional monsters and mapping graphics. No two trips into the dungeon are quite the same.

Cosmic Trader is a multiplayer game of interstellar trade. Up to four people try to amass a fortune by commanding their own star freighter in a quadrant consisting of nine star systems with nine categories of trade goods. Players must negotiate all transactions with alien merchants (the computer). Players must cope with sudden changes in the marketplace and in market prices. The user can adjust the game length.

Both programs are on cassette and come with complete instructions for \$12.95, plus \$1 per order for shipping. Reader Service number 487.

Nutritional Software

Nutri-Pack is a series of programs and a data base for the Apple II to help you evaluate the nutritional quality of your daily diet. The programs allow you to quickly retrieve information from, modify and add to a data base containing over 600 different foods. The data base contains information on the caloric, fat and protein content and the levels of eight vitamins and minerals in the listed foods. Price for the disk version is \$39.95.

Micro-Comp, Inc., 2015 NW Circle Blvd., Corvallis, OR 97330. Reader Service number 490.

Adventure Game

Dungeons is a fantasy adventure for the OSI computer in which the player assumes the role

of a fighter, dwarf, halfling, elf or magic-user in search of gold in the unexplored dungeons beneath the wizard's city or in the forest that surrounds the city. Evil monsters lurk in the forest and dungeons to guard the gold. It is based on the Dungeons and Dragons game. The adventure is graphically displayed for the C1, 2, 4 and 8P. Price is \$12.95 for the cassette and \$15.95 for 5 1/4 or 8 inch disk. Both versions require 8K.

Aurora Software Associates, 353 S. 100 E. #6, Springville, UT 84663. Reader Service number 488.

For Dentists Only

Graham-Dorian Software Systems, Inc., 211 N. Broadway, Wichita, KS 67202, introduces a computer software dental package written and tested by dental professionals. It handles patient records of charges, payments, insurance, delinquent accounts and daily and monthly transactions. It prints out patient statements and standard insurance forms for the American Dental Association (ADA).

The package can be ordered on standard 8 inch disk or various mini-floppy disks. Each package includes the software in INT and BAS file form plus a user's manual and hard-copy source listing for easy customizing. The package utilizes a two-disk storage system. Reader Service number 491.

Inventory Program

Micro Business World, 15818 Hawthorne Blvd., Lawndale, CA 90260, announces the Inventory Control System for the Apple II. The program will handle up to 8100 items and contains a transaction register, fast data retrieval and audit trails. It will generate inventory status reports, reorder reports and keep track of purchase orders automatically. It may be used in a retail or wholesale environment and will handle multiple departments or divisions. Minimum hardware requirements are an Apple II Plus with 48K, one disk drive and an 80-column printer. Price is \$99. Reader Service number 492.

DBMS Business Program

Info/80 is a data base management system (DBMS) that runs under the CP/M operating system by Digital Research and utilizes Microsoft's Compiled (C-80) BASIC. This product features an effective and user-oriented method

of maintaining bookkeeping, recordkeeping and management information systems tailored for individual businesses. It is operational on various disk devices ranging from 8 inch diskette to multi-megabyte hard disk with the size of the data base the controlling parameter. Thus, it can manage both a small limited application and a complete multi-application for a full on-line integrated business system.

Data Train, Inc., 840 NW 6th St., Suite 3, Grants Pass, OR 97526. Reader Service number 493.

Business Software

L216 is a business software package for TRS-80 systems with 16K memory and Level II BASIC. It consists of the following programs: a cassette data base manager, a word processor, an inventory control system, a stock management program, a label printer, a deposit calculator and a statistics program. It also features a sort utility and a key access utility, which can be included as part of the user's program. Price is \$59.

Micro Architect, Inc., 96 Dothan St., Arlington, MA 02174. Reader Service number 494.

OSI Compiler

XPLO is a block-structured, high-level compiler language for Ohio Scientific computers. This new programming language includes a self-contained editor and run-time interpreter. The editor allows easy source code creation and editing, and the interpreter makes XPLO programs transportable to any computer that has the interpreter written for it. Also, the block structure allows the creation of easy-to-understand, self-documenting code.

The diskette package (\$79) comes complete with utility programs: DIRectory, CREATE and DELETE, all written in XPLO. The diskette also has some sample programs in XPLO. The cassette version costs \$75. The 34-page manual, which may be purchased separately for \$9.95, has sample programs, tips and a section on using the editor.

Pegasus Software, PO Box 10014, Honolulu, HI 96816. Reader Service number 495.

AppleRoots

AppleRoots is a combination genealogy/animal breeding program that has 17 user-definable fields to specify the title and length of the field. The program will default to 17 titled fields. Functions include: configure system, enter records, change records, delete records, print index or records, print list of children, print family records and print four-generation pedigree chart. All printer functions can be displayed on the screen or sent to the printer. All functions are menu-oriented; no programming is required to custom-configure the system for your personal use. It is written in Applesoft and

requires a single disk drive with 24K RAM. Price is \$39.95.

CDS Corp., 695 East 10th North, Logan, UT 84321. Reader Service number 498.

BASIC-FORTRAN Translator

Now you can convert software written for DEC, IBM and any other ANSI standard FORTRAN system into microcomputer-compatible BASIC with Convert, a software package for translating programs in BASIC to FORTRAN and programs in FORTRAN to BASIC.

Convert allows special BASIC command definition and FORTRAN device number specification to ensure accurate translation between any microcomputer and FORTRAN system. This translator is available in either the version I source code written in BASIC or the version II source code in FORTRAN. Both versions will operate on all popular computers with either a BASIC or FORTRAN compiler, respectively, and a minimum of 8K. The program is supplied on cassette for Ohio Scientific and TRS-80 and on floppies for Alpha Micro. A tape is also available for DEC, Prime or IBM systems. Price is \$115.

Cognitive Electronics Laboratory, PO Box 615, New Braunfels, TX 78130. Reader Service number 497.

Pinball Game

Pinball is an arcade game written in machine language for the Radio Shack Model I Level II TRS-80. The screen displays flippers, bumpers, rollovers, runs and bonus points. The space bar on the TRS-80 releases the ball at various speeds under player control. Ball speed and acceleration depend on the contact with various features on the board, including the mysterious "Bermuda Square." Price is \$14.95 on cassette or \$20.95 on disk.

Acorn Software Products, Inc., 634 North Carolina Avenue, S.E., Washington, D.C. 20003. Reader Service number 496.

MDBS Software

Micro Data Base Systems, Inc., PO Box 248, Lafayette, IN 47902, has recently released version 1.03 of its network data base management system (MDBS) designed to run on Z-80, 8080, 8086 and 6502 processors. The current version requires about 18K on Z-80 machines. MDBS furnishes a collection of different, relatively simple commands. The task performed by each command is identified in the command's mnemonic. You are not restricted to getting, modifying and deleting data for the current record of the run-unit only. The design of MDBS allows you to write and execute application programs without having previously defined subschemas for them. The MDBS-Z-80 costs \$750; prices for other processors are higher. Reader Service number 499.

NEW PUBLICATIONS

Challenger III Service Manual—handbook containing fold-out schematic diagrams, pictorial diagrams, block diagrams, parts lists, memory maps, board placement diagrams and component pin-outs for the 13 circuit boards used in OSI's business computer systems.

Ohio Scientific, 1333 Chillicothe Rd., Aurora, OH 44202.

MicroShopper 80: The New Computers—1980 edition of business and personal guide to microcomputer hardware and software, including over 500 products.

The Phoenix Group, 1425 West 12th Place, Tempe, AZ 85281.

Heathkit Spring Catalog—free 104-page catalog that contains descriptions of nearly 400 different electronic kits for home or business. Heath Company, Dept. 350-270, Benton Harbor, MI 49022.

Micro Media Magazine—floppy-disk-based bimonthly publication that features software, reviews, graphic art, advertisements and articles for the Heath H8, H88 and H89 and the Zenith Z89. Available in both Benton Harbor and Microsoft, as well as in either HDOS or CP/M disk format.

Micro Media Magazine, 1316 Elmhurst Dr., Garland, TX 75041.

Computers in Psychiatry/Psychology—bimonthly newsletter for professionals interested in the use of computers in psychiatry and clinical psychology.

Computers in Psychiatry/Psychology, 26 Trumbull Street, New Haven, CT 06511.

Data Bits—monthly newsletter that coordinates nationwide the data and automation efforts of health planners within the 205 health systems agencies and 51 state health planning and development agencies.

Hapenny Associates, PO Box 1076, Columbia, MD 21044.

Software Vendor Directory—listing of over 700 vendors within 35 categories of hardware and operating systems.

Micro-Serve, Inc., PO Box 482, Nyack, NY 10960.

Archer Engineer's Notebook—handbook of 415 electronic circuits for electronics hobbyists, experimenters, technicians and engineers.

Radio Shack, 1300 One Tandy Center, Fort Worth, TX 76102.

Nibble—magazine published eight times a year that focuses on the Apple II and Apple II Plus computers.

Micro-Sparc, Inc., PO Box 325, Lincoln, MA 01773.

All About Personal Computers—report that traces the development of the personal computer, discusses applications and future trends and outlines how to buy a computer. Datapro Research Corporation, 1805 Underwood Blvd., Delran, NJ 08075.

LOOKING FOR TRS~80* **BUSINESS SOFTWARE?** **WE HAVE HUNDREDS** **OF QUALITY BUSINESS** **PROGRAMS IN STOCK!** **AT PRICES YOU CAN** **AFFORD.**

◀ WHERE YOUR TRS~80* MEANS BUSINESS ▶

For the first time you can fill most of your software needs with one telephone call. Whether you are trying to find a specific program, custom software or just help with your system—give us a call. We have the people that count!

Invoicing • Inventory Control • Accounts Payable • Accounts Receivable • Payroll • General Ledger • Letter Writer • Word Processing • Mailing • Manufacturing Inventory • Cost Accounting • Sales Reporting • Stock Market • Business Statistics • Statistical Analysis • Data Base Systems • Medical Billing • Dental Billing • Special Industries • Advanced Accounting • Income Tax • Language • Personal Finance • Technical Programs • Insurance • CPA • Law Office • Asset Depreciation • Job Cost • Utility Programs • Education • Games • Home Programs • Loans • Credit Bureau • Electronics • Test Systems • Sports • Art • DOS Systems • BASIC lessons • and hundreds more!

Send for our free catalog or give us a call today. We also do custom programs as well as buy top quality programs.

Summer Special:
Complete business system \$299.95

**OVER 100 OF THE BEST
BUSINESS PROGRAMS FOR
THE TRS~80* MODEL I
AND MODEL II IN STOCK
READY FOR
IMMEDIATE DELIVERY.**

**LET US ANSWER YOUR
QUESTIONS TODAY.**

Software-Mart ✓ 322

24092 Pandora St • El Toro CA 92630



(714) 768-7818



24 Hour Service

**OUR BEST ADS ARE NOT WRITTEN —
THEY'RE RUNNING ON TRS~80's**

* TRS-80 is a trademark of the Radio Shack Division of Tandy Corporation.

PET-POURRI

Carl Moser of Winston-Salem, NC, was the first to provide a comprehensive machine language assembler for the PET and other 6502-based systems. The assembler program itself was written entirely in machine language and ran much faster than other assemblers written in BASIC.

The program was not very well publicized or advertised, since it required at least 16K of memory and was not practical on an 8K PET. But Moser has teamed up with J. R. Hall and formed Eastern House Software (EHS) of 3237 Linda Drive, Winston-Salem, NC 27106. They are now advertising several products for the 6502 microcomputer market, primarily for the PET.

Their most interesting product is the MAE, a new macro assembler/text editor package for the 32K PET with a 2040 disk drive. This package is similar to the older assembler, but is now greatly enhanced with the exclusive use of disk files. MAE appears to be the most powerful 6502 assembler and text editor package on the market.

The MAE comprises the macro assembler (ASSM) and text editor (TED), which reside simultaneously in 10K bytes of memory

(5000-77FF hex). In addition to the 10K for MAE, sufficient memory must be allocated for label and text files, which normally take up locations 1800-2FFC and 3000-4FFC hex respectively. These boundaries leave memory for an extended monitor at 1000-17FF hex, for DOS support (wedge) in upper memory, and for BASIC and machine language programs at 0400-1000 hex.

The label and text files are position-independent and may be located almost anywhere in RAM memory. In addition, records within these files are variable in length and directly dependent on the number of characters to be stored. This results in more efficient memory use.

The TED occupies about one-half the memory space. It sets up and maintains the source file by interacting with the user via 27 commands (Table 1). When inputting to the TED, you have the full capabilities of the built-in cursor-oriented screen editor, and can automatically repeat any key held for a half-second or more. Source files are created and edited much like BASIC programs are normally handled by the PET operating system, so it is very easy to get used to.

The assembler scans the source program in the text file and creates a label file (or symbol table) on the first pass. An optional listing is generated during the second pass, and a relocatable object file can be generated by a third pass. The relocatable object file is recorded on disk and, with a separate relocating loader program, can be relocated almost anywhere in memory.

The loader can relocate your program in three segments: page zero variables, absolute variables and program body. When not generating relocatable object, the assembler can store the executable object code directly into memory. The code can even be stored at a different address from its execution address. This can be useful if you want to execute in memory space occupied by MAE or any of its work files.

The assembler source statements consist of a required line number, along with standard label, mnemonic, operand and comment fields, in a free format. That is, each field need not start in a specific column or character position. Labels can be up to 31 characters long while standard 6502 mnemonics and addressing mode formats are used. Symbolic, decimal, hex, binary and ASCII values can be entered and expressions can contain addition or subtraction operators. There is even a way to obtain just the high or low part of an address.

The conditional assembly features direct the assembler to conditionally assemble certain portions of your program and skip other portions. The macro facilities are extensive, with non-repeating labels, nested macros and conditional assembly within macros. Table 2 lists the standard assembler pseudo ops.

Source for a large program can be divided into several modules, each entered into the text file one at a time and recorded on disk. These modules can then be linked during assembly via a control file, which specifies the order the modules are assembled in. At assembly, the assembler will load and assemble each module until the entire program is done.

The MAE assembler also provides a unique interactive assembly mode. The assembler can print messages and/or accept keyboard input during the first pass of the assembly. This provides many possibilities, such as specifying the actual assembly start address when the assembly begins.

For program debug, an extended monitor is included in the MAE package. This program is a 2K extension of the PET monitor that occupies locations 1000-17FF hex. A BASIC program on the MAE diskette provides an interactive review of the extended monitor commands and instructions on how it can be relocated to another area of memory. The extended monitor provides commands for dis-

ASSEMBLE:	Loads text file and begins assembly.
AUTO	Begin auto line numbering with next user entered line number.
ALPHA:	Select whether shifted characters will be graphics or lowercase.
BASIC:	Restore zero page and go to BASIC.
BREAK:	Restore zero page and go to monitor.
CLEAR:	Clear text file.
COPY:	Copy lines in the text file to a new location.
DC "command":	Pass disk command to PET 2040 disk.
DELETE:	Delete entries in text file.
EDIT:	Edit text file line or perform string search and replace.
FIND:	Search for string.
FORMAT:	Sets/clears formatting of text file when output. When formatted, fields of each line will be in tabular form.
GET:	Reads text file from disk into text buffer.
HARD:	Sets/clears formatting of listings for hard copy with page numbers.
LABELS:	Prints all or part of the label file.
MANUSCRIPTS:	Selects whether or not line numbers are printed. With this feature, MAE can be used as a simple text editor to create manuscripts or program documentation.
NUMBER:	Renumbers the text file lines.
OUTPUT:	Creates a relocatable object file on disk.
PASS:	Executes second assembly pass if first pass was previously performed.
PRINT:	Prints the text file data.
PUT:	Writes all or part of the text file to disk.
RUN:	Initiates execution of a previously assembled program. A symbolic label can be entered and MAE will find the correct starting address from the label file.
SET:	Reads or sets the text file, label file, and relocatable buffer boundaries. It can also be used to determine the remaining space in the text file.
TI:	Assigns terminal output to the PET or a serial device. Optionally, complete input and output can be assigned to an external serial device. MAE contains a built-in software UART routine to communicate with the serial device via the PET user port. Permissible baud rates range from 110 to 9600 baud.
TO:	Assigns terminal output to the PET CRT, IEEE device #4 (printer), or an external serial device. Optionally, output can be directed to both the IEEE and external serial device.
USER:	Restores zero page and goes to location \$0000.

Note: Most of the commands have many options to allow ranges of lines, specifying strings and file names, etc. This list is only meant as an overall summary of the MAE TED capabilities, which are extensive.

Table 1. MAE TED commands.

assembly, enable/undo stop key, fill memory, hunt memory, interrogate memory, quick trace, memory transfer, walk code and others.

In four weeks of testing, I found the MAE package to be well documented, and I had no problems learning to use the text editor and assembler. The assembler was fast and program debugging went quickly. The ability to assemble and debug a program with everything resident in memory greatly reduced normal program debugging time.

This package should be indispensable if you are doing any amount of machine language programming, but the price (\$169.95) may be a little steep for a home system. The package includes an excellent 44-page manual, which has clear instructions and many examples. It even includes a sample program to help clear up several areas.

The programs are distributed on a 2040 compatible floppy diskette with the following files:

- DOS support (wedge),
- Extended monitor object code,
- Extended monitor instructions,
- MAE object code,
- Relocating loader object code,
- Relocating loader relocatable object code, (so you can relocate the relocating loader),
- Library of PET RAM locations for the 32K PET in a MAE source file,
- Notes pertaining to MAE and

- .BA — Begin assembly at the specified address.
- .BY — Store bytes of data specified in hex, decimal, binary or ASCII strings.
- .CE — Continue assembly if not one of three fatal errors.
- .CT — Designates current contents of text buffer as a control file. This allows use of the .FI pseudo ops to link to other files. Only one control file may exist during each assembly.
- .DE/.DI — Define an external/internal label and its corresponding value.
- .DS — Define a block of storage (with undefined contents).
- .EN — Indicates the end of the source program.
- .EC/.ES — Disable/enable output of macro generated object code in source listings.
- .EJ — Eject to the top of the next listing page.
- .FI — Assemble the specified file before continuing with the following statement. This pseudo op is only allowed in a control file!
- .IN — Output a question mark and accept exactly four hex digits as input which are assigned to a label and stored in the label file. Input will only occur on the first pass of the assembly.
- .LC/.LS — Disable/enable source file listing during pass 2.
- .MC — Store object code at specified address even though assembled for a different address.
- .MD/.ME — Start/end macro definition.
- .MG — Declares the entire contents of the text as a macro global file.
- .OC/.OS — Disable/enable storing of object code in memory.
- .PR — Output the specified text during pass 1. This is intended to be used in conjunction with the .IN pseudo op to request user input during assembly.
- .RC/.RS — Provides a directive to the relocatable loader to stop/start relocation requirements and store code at the proper address.
- .SE/.SI — Define an external/internal address constant.

Table 2. MAE assembler pseudo ops.

● Example program (UART driver).

By the way, another interesting product advertised by EHS is their PET RABBIT program. This is a 2K machine language program that allows loading an 8K program from tape in just 38 seconds. It also provides a RAM

memory test, a keyboard auto repeat feature and several other commands. It costs \$29.95.

A number of versions are available for each machine, depending on the desired code location. Contact EHS for more information on this and other products.

COMPUTER CLINIC

I am the proud owner of an 8K PET with upgraded ROMs and a Betsi waiting to be brought on-line. I am an analyst-programmer for the Australian government, so my background is in programming. I am interested in corresponding via programs or letters with any interested persons.

David Jones
34 De Graaf St.
Holder Australian Capital Territory 2611
Australia

Does anyone out there recognize any of the following computer-circuit cards? These are all hamfest specials bought to build a cheap computer. Any photocopies of condensed manuals or schematics would be appreciated. Will pay for the favor. I've included all identification I could find.

1. Data media 8080A CPU card. 2DAAA005, 9.36 MHz xtal, dated April 21, 1978, 2 2101. Two empty 2101 slots, about 50 TTL, two Z 8-pin sockets, all chips TI, 100-pin edge connector (not S-100). (Got two for \$5 each.) Maybe goes to a Datamedia smart terminal.

2. Small unknown 6503 card. TCI-1 logo. 6503, 6530, 6532 chips, 3.579 xtal, 36-pin connector on one side, 38 pin connector on other side, paper tag says P/A model uP7-1, Rev. C C11-80139 on card. (Paid \$25.) Maybe a video processor?

3. Big Univac memory card. ID numbers 7318-2-73 (1973?), 38-75, BE-3, Assy. 4161700-05. Seventy-two Intel 4915636 MOS, B 7720A chips (18 pin, 256×4 RAMs?), two 100-pin connectors on one side.

3534009-01 Rev. G 127 stamped on other edge connector (Paid \$5.)

4. Small RAM cards. Told they go to "Accukeyer"; "memory board 1769-25" stamp. Twenty-four Intel C1101A 256×1 RAMs, 2K×3, 44-pin connector. (Got four for \$2.50 each.)

Charles Gerbino
1831 Stanley Place
Falls Church, VA 22043

The Psychology Department at the University of North Carolina at Chapel Hill is currently in the planning stages of a computer based "lab" for undergraduates. We chose the Apple microcomputer and decided upon Pascal as the programming language. We would appreciate hearing of any applicable software that is available.

R. F. Genovese
Dept. of Psychology
The University of North Carolina at Chapel Hill
Davie Hall 013 A
Chapel Hill, NC 27514

I am willing, even anxious, to open my Tektronix 4051 computer. Can anyone supply references and product names on how to modify this system and/or adapt other 6800 products to it?

Dr. George E. Sinclair
1985 Devonshire Drive
Sierra Vista, AZ 85635

LETTERS TO THE EDITOR

Two comments on W. A. Harrison's article, "Programming Optimization Techniques" (May 1980)

For shame! The very first rule in optimizing the performance of a program is to fully understand the environment in which the program is to execute. This means a rather detailed understanding of object code produced by your compiler, or the functional characteristics of your interpreter, and a detailed understanding of the instruction set and instruction timings of your processor.

Mr. Harrison's remarks may have held true on the system with which he is working, but to take that kind of ivory-tower thought and spread it around as universal truth is certainly a disservice to computer users generally.

I imagine that Mr. Harrison was working

with a compiler, if he tested his examples at all. I suspect that most of his remarks would be appropriate in that environment, but I am sure that 99 percent of your readers are using an interpreted BASIC, rather than a compiled BASIC.

Getting down to brass tacks, in Example 8, three ways of skinning a cat are shown, marked "inefficient," "more efficient" and "most efficient." I have implemented these three approaches in Listings 1, 2 and 3, respectively. The execution times (on a TRS-80 model II) were 65 seconds, 68 seconds and 72 seconds, respectively, *exactly the opposite* of what Mr. Harrison would lead you to believe.

Generally, with an interpreter, it is preferable to reference an initialized variable rather than a constant. The process of fetching the value of a known variable is quicker than evaluating the literal. The failure of the "most efficient" example is simply based on the fact that the overhead of interpreting an extra statement for the temporary variable costs far more than the subscripted references.

I have seen many instances where a young programmer will go to great pains to optimize the efficiency of a program he is coding, only to be shot down because he doesn't really under-

stand what is happening at the next level down.

I welcome technical articles on programming techniques, but please try to improve the level of applicability to the real world as opposed to painting towers an ivory color.

Robert Snapp
President
Snapp, Inc.
Cincinnati, OH

"Programming Optimization Techniques" was well-written and accurate with one glaring exception. Harrison stated that "access (speed) can be increased by using a constant as a subscript rather than a variable (i.e., V(7) instead of V(K))."

On any computer with BASIC language, at least those which utilize interpreters rather than compilers, the opposite is true. A variable subscript results in significantly faster operation time than a constant. This is because it takes the computer longer to convert a constant into its binary floating-point equivalent than it takes it to look up and retrieve a variable value.

Examples of the time difference are displayed on the printout from our Commodore PET computer running routines using variable subscripts versus constants (Listing 4). I verified the same time savings with a similar routine on a Data General minicomputer with time-sharing BASIC. I've found one of the keys to swift program operation to be the liberal use of variables in any application where the value is referenced repeatedly.

Steven G. Spearman
Hastings, NE

```
1000 CLS
1010 CLEAR 1000
1020 DEFINT A-Z
1030 DIM C(1000)
1040 A$ = TIME$
1050 PRINT TIME$
1060 K = 750
1070 FOR I = 1 TO 10000
1080 M = C(K) + 8
1090 Z = C(K) / 2
1100 NEXT
1110 PRINT TIME$
1120 END
```

Listing 1.

```
1000 CLS
1010 CLEAR 1000
1020 DEFINT A-Z
1030 DIM C(1000)
1040 A$ = TIME$
1050 PRINT TIME$
1070 FOR I = 1 TO 10000
1080 M = C(750) + 8
1090 Z = C(750) / 2
1100 NEXT
1110 PRINT TIME$
1120 END
```

Listing 2.

```
1000 CLS
1010 CLEAR 1000
1020 DEFINT A-Z
1030 DIM C(1000)
1040 A$ = TIME$
1050 PRINT TIME$
1070 FOR I = 1 TO 10000
1075 T = C(750)
1080 M = T + 8
1090 Z = T / 2
1100 NEXT
1110 PRINT TIME$
1120 END
```

Listing 3.

THIS ROUTINE TOOK 27.0833334 SECONDS

```
10 REM ** ARRAY ASSIGNMENT USING
20 REM ** CONSTANT SUBSCRIPT:
40 S=TIME:REM S=STARTING TIME (JIFFIES)
50 FOR I=1TO5000:V(7)=4:NEXT
60 S=TIME-S:REM S=TOTAL TIME
70 OPEN1,4:CMD1:REM ACTIVATE PRINTER
80 PRINT:PRINT:PRINT"THIS ROUTINE
TOOK";S/60;" SECONDS"
90 LIST
```

THIS ROUTINE TOOK 25.0333333 SECONDS

```
10 REM ** ARRAY ASSIGNMENT USING
20 REM ** VARIABLE SUBSCRIPT:
30 K=7:REM VARIABLE ASSIGNMENT
40 S=TIME:REM S=STARTING TIME (JIFFIES)
50 FOR I=1TO5000:V(K)=4:NEXT
60 S=TIME-S:REM S=TOTAL TIME
70 OPEN1,4:CMD1:REM ACTIVATE PRINTER
80 PRINT:PRINT:PRINT"THIS ROUTINE
TOOK";S/60;" SECONDS"
90 LIST
```

THIS ROUTINE TOOK 23.3666667 SECONDS

```
10 REM ** ARRAY ASSIGNMENT USING
20 REM ** ALL VARIABLES:
30 K=7:L=5000:W=4:B=1
40 S=TIME:REM S=STARTING TIME (JIFFIES)
50 FOR I=BTOL:V(K)=W:NEXT
60 S=TIME-S:REM S=TOTAL TIME
70 OPEN1,4:CMD1:REM ACTIVATE PRINTER
80 PRINT:PRINT:PRINT"THIS ROUTINE
TOOK";S/60;" SECONDS"
90 LIST
```

Listing 4.

Harrison replies to criticisms

I enjoyed reading Mr. Snapp's letter immensely. As to his first remark, he is correct! When attempting to facilitate *machine dependent* optimizations upon programs, you should be familiar both with your machine and your translator, be it a compiler, an interpreter or an undergraduate research assistant toggling 0's and 1's into the front panel of your machine. My purpose in writing "Programming Optimization Techniques" was to present a number of commonly used *machine independent* optimization techniques.

Mr. Snapp's remarks about compilers vs interpreters were noted, and I agree with him on

that point. As he has shown, the use of a constant as a subscript is not more efficient than using a variable. However, when using a compiler (there's a rumor afoot here at the "tower" that there actually is a compiler or two available for the micros), the use of a constant as a subscript can result in a substantial improvement in performance. This is because the address of the array element can be computed and inserted at compile time. Because of this, a reference to the array element at execution time would be similar to a reference to a scalar.

On the other hand, if you use a variable as a subscript, the machine must constantly (or perhaps *un-constantly*?) compute the location of the element at execution time. I realize that this is dependent upon the use of a compiler, yet if Mr. Snapp's arguments were to be touted as "universal truths" the readers with compilers would be misled in a similar manner.

As for Mr. Snapp's Listing 3, it is rather obvious why it ran slower than either of the others. The very first point that I attempted to make in "Programming Optimization Techniques" was that invariant calculations should be put *outside* the loop (see Example 1). Therefore, if Mr. Snapp were to move line 1075, I'm quite sure that he would notice a substantial improvement in performance. After all, 9,999 needless evaluations of $T = C(750)$ can be time-consuming.

As for "ivory-tower" thought, I'm afraid that it would be a bit presumptuous of me to consider "Programming Optimization Techniques" an example of *ivorytower-think* (to borrow from Orwell). Please do not confuse theory with uselessness. Almost everything which has anything to do with computers was no more than a theoretical concept five, ten, 20 or 30 years ago.

For a survey of "ivory-tower" optimization, I suggest you see:

● Aho, A. V., and Ullman, J. D., *The Theory*

(continued on page 218)

inefficient	efficient
00100 FOR K = 1 TO 1000	00100 B = C + R
00110 B = C + R	00110 FOR K = 1 to 1000
00120 Q1 = Q(K)/B	00120 Q1 = Q(K)/B
00100 NEXT K	00130 NEXT K

Example 1.

```
TEST:
PROCEDURE OPTIONS (MAIN);
DCL X(100) FIXED BIN (15) INIT((100)10);
DCL N FIXED BIN (15);
DCL I FIXED BIN (15);
DO I=1 TO 25000;
    N=10+X(75);
END;
END TEST;
CPU Time: 11 Seconds
LISTING PL/I - 1
```

```
TEST:
PROCEDURE OPTIONS (MAIN);
DCL X(100) FIXED BIN (15) INIT((100)10);
DCL N FIXED BIN (15);
DCL I FIXED BIN (15);
DCL K FIXED BIN (15);
K=75;
DO I=1 TO 25000;
    N=10+X(K);
END;
END TEST;
CPU Time: 12 Seconds
LISTING PL/I - 2
```

```
TEST:
PROCEDURE OPTIONS (MAIN);
DCL X(100) FIXED BIN (15) INIT((100)10);
DCL N FIXED BIN (15);
DCL I FIXED BIN (15);
DCL ITEMP FIXED BIN (15);
ITEMP=X(75);
DO I=1 TO 25000;
    N=10+ITEMP;
END;
END TEST;
CPU Time: 11 Seconds
```

Listing 7.

```
INTEGER I(100) /100*10/
DO 100 J=1,25000
    N=10+I(75)
100 CONTINUE
STOP
END
CPU Time: 6 Seconds
```

LISTING WATFIV-1

```
INTEGER I(100) /100*10/
K=75
DO 100 J=1,25000
    N=10+I(K)
100 CONTINUE
STOP
END
CPU Time: 6 Seconds
```

LISTING WATFIV-2

```
INTEGER I(100) /100*10/
ITEMP=I(75)
DO 100 J=1,25000
    N=10+ITEMP
100 CONTINUE
STOP
END
CPU Time: 4 Seconds
```

LISTING WATFIV-3

Listing 5.

```
INTEGER I(100) /100*10/
DO 100 J=1,25000
    N=10+I(75)
100 CONTINUE
STOP
END
CPU Time: 3 Seconds
```

LISTING FORTRAN IV - 1

```
INTEGER I(100) /100*10/
K=75
DO 100 J=1,25000
    N=10+I(K)
100 CONTINUE
STOP
END
CPU Time: 4 Seconds
```

LISTING FORTRAN IV - 2

```
INTEGER I(100) /100*10/
ITEMP=I(75)
DO 100 J=1,25000
    N=10+ITEMP
100 CONTINUE
STOP
END
CPU Time: 3 Seconds
```

LISTING FORTRAN IV - 3

Listing 6.

EXATRON STRINGY FLOPPY Owners Association Newsletter

Secretary Fred Waters

This month we are presenting a slightly different view of the Stringy Floppy. For months we have expounded the virtues of the "Stringy" and our Program Chairmen and users group organization. This month we are presenting a letter written by one of the program chairmen in response to a written inquiry by a potential "Stringy" owner. We present the letter in its entirety and without editing.

Richard Harrison
Rt. 2 Drysdale
Warrenton, Virginia 22186

6 May 1980

Mr. David L. Johnson
4106 Montreal Avenue
Prince George, VA 23875

Dear Mr. Johnson,

First of all please excuse the long delay in responding to your letter. The demands of my regular job keep me on the go for long periods of time.

I will key my response to the items as listed in your letter:

1. The STRINGY will give you excellent results with the TRS-80 Mod I (with or without the expansion interface.) STRINGY models are available for use with S-100 configurations: again results will be excellent.
2. Sorry, but cannot comment on machine language text editors for the Poly-88 system. Highly recommend the Electric Pencil for the TRS-80 (definitely over the R/S Script). Yes the Electric Pencil can be used with the STRINGY; and the files are stored on wafers.

3. I have several systems in use for general computing and specific applications, but the STRINGY is used on the TRS-80 Mod I 48K system. The STRINGY has been in use for one year now and other than two MECHANICALLY faulty tapes there has NEVER been a bad load or save with the unit. There is no 'Foolery' associated with the STRINGY, and as such it is a real work-horse which is elegant in its operational simplicity yet ultra-reliable.

4. My main application for STRINGY is in support of my Communications Repair business, i.e., inventory, billing, work processing etc. But that is not the ACID test for the unit. . . my kids are. The kids use it daily for games, education and general computer exploration. None of the sensitivities normally associated with floppy disc apply to the STRINGY. Sir, I have dealt with many computer companies over the past five years and there are only two which I have not found fault with either their product or the company officials, they are: EXATRON and APPARAT. What this means to you is that you will receive courteous responses over the telephone and prompt written replies, when requested (your chances of being ripped-off are slim with EXATRON).

Mr. Johnson, I am taking the liberty of sending a copy of this to EXATRON so that they may answer your questions regarding Poly-88 application in more detail and also get you on their literature mailing list.



Priced like a cassette; performs like a disk.

Best Regards and Happy Computing.

Sincerely,

Richard J. Harrison

P.S. This letter is prepared using the STRINGY and Electric Pencil. If you are a HAM, will discuss this further over the radio sometime. My call is N2JR.

This is only a sample of the positive mail we receive each week and to us it is the best possible way to gauge the success that we are achieving through our efforts to provide a good product at a reasonable price with real product support.

With this issue, we are finally introducing the APPLE version of the Stringy Floppy. It has been a long wait but they are

finally in production. Please see our ad elsewhere for more information or call our toll-free hot line. Watch this space next month for the introduction of the PET version.

INFORMATION & ORDERS

The ESF is assembled and tested at the factory, with a 30-day moneyback guarantee and a one year full warranty. For fastest delivery, phone in your credit card or COD order using the toll-free line below.

Base price for the TRS-80 ESF, \$249.50 (ask about the Starter Kit); for the S-100 ESF, \$289.50; Apple with single drive is \$299.50, dual drive is \$499.50.

Info packets at no charge; users manuals for the TRS-80 ESF are available for \$3.00 for shipping.

Handling is extra.

If you have any questions about these products, about Exatron or about ESFOA call the Hot Line. Address letters to ESFOA, 181 Commercial Street, Sunnyvale, CA 94086.

Stringy Floppy is a trademark of Exatron Corporation. ✓7

HOT LINE

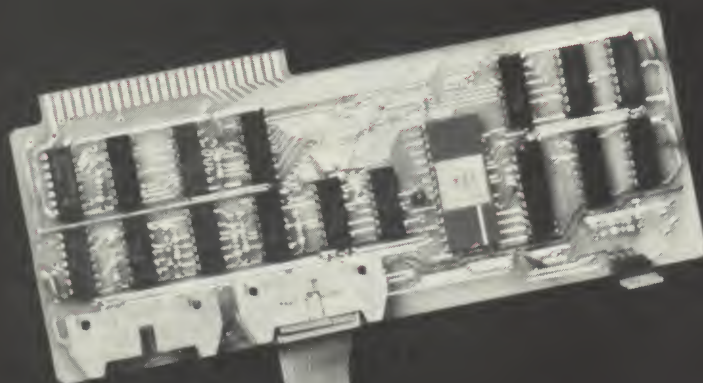
800-538-8559

WITHIN CALIFORNIA

408-737-7111

FINALLY

AN ALTERNATIVE TO DISKS THE EXATRON STRINGY FLOPPY (MASS STORAGE SUBSYSTEM) LOW COST - RELIABILITY - SPEED



INFORMATION PACKAGES AVAILABLE NOW FOR:

APPLE
PET
TRS-80
OSI
KIM/SYM/AIM
S-100
RS-232
STD-BUS
OEM



 **exatron**

\$299.50

CALL OUR HOT LINE TODAY 800-538-8559

TO REQUEST AN INFORMATION PACKAGE
EXATRON, INC. ■ 181 COMMERCIAL STREET ■ SUNNYVALE, CA 94086



The 16-Bit Super Processors Are Here

This report zeroes in on the Intel 8086, the Zilog Z8000 and the Motorola MC68000.

Martin Moore
2735 S.W. 229
Beaverton, OR 97006

The gurus of the microprocessor business have been predicting a takeover by the 16-bit microprocessor for some time now. They told us about three years ago that the 16-bit microprocessor was just around the corner, and that the 8-bit machines had better heed the warning. And, as if to prove it, Texas Instruments came out with the TMS9900 microprocessor, the first, low-cost 16-bit microprocessor to hit the streets.

People didn't take to it immediately. The noise about 16-bit machines turned into a deafening silence. But it seems those gurus were right after all. They were just a little ahead of their time. The 16-bit revolution has come.

At this writing, at least four 16-bit microprocessors are available: Intel's 8086, Zilog's Z80000 (second-sourced by Advanced Micro Computers, Inc.), Motorola's MC68000 and Fairchild's 9440 Microflame.

The 16-bit microprocessors discussed here (I'm purposely leaving out the Fairchild 9440 because of its close resemblance to the Data General microNOVA) refer to memory as bytes, and for a very good reason. Few memory boards are set up to handle a 16-bit data bus. Almost everything available is for the 8-bit microprocessor. The manufacturers took this into consideration when designing their processors. Designing a microprocessor that can't access 8-bit memories is pointless. For this reason, all the manufacturers have built their devices to work with byte-oriented memory.

The 8086 Architecture

By using a silicon-gate HMOS process, Intel has managed to cram 29,000 transistors onto a very small die about 225 mm

square (less than the area of Lincoln's head on the penny). That many transistors allow the 8086 to be divided into what are basically two processors. Fig. 1 shows a functional block diagram of the 8086.

Notice that the 8086 is divided into two halves called the bus interface unit (BIU) and the execution unit (EU). The 8086 performs a neat little trick by letting the BIU collect and send program information while the EU executes it. The BIU fetches instructions before they are required by the EU; it then loads the instructions in a stack, or queue, that will hold up to six bytes of instruction. The EU takes the instructions as it needs them, without having to wait for bus cycles, and without having to control such things as operand fetch and store, address location and bus control.

The process of parallel and simultaneous operation is called pipeline processing. It speeds instruction execution by never forcing the processor to wait while an instruction is being fetched.

Registers

The register structure of the 8086 is shown in Fig. 2. The 8086 contains 12 16-bit registers and a set of nine 1-bit flags. The asterisks in Fig. 2 represent the 8080A registers as a subset of the 8086 registers. This allows the 8086 to execute the 8080A instruction set without too much trouble.

The registers are grouped together within the 8086. Each group has a specific set of functions. The AX, BX, CX and DX registers are called the general register group, which are used in the arithmetic and logic operations of the 8086. Both halves of each register are separately addressable. Thus, you can think of this group as being two sets of four 8-bit registers.

The next four registers (SP, BP, SI and DI) are called the pointer and index register

group. They usually contain addressing off-set values.

The instruction pointer (IP) register works in the same way as the 8080A program counter register.

The flag register contains nine 1-bit operation flags. The flags record 8086 status and are used to control the 8086 operation. Five of the flags are 8080A flags; four new flags have been added for the 8086.

Finally, the CS, DS, SS and ES registers, called the segment register file, are used in all memory address computations. For example, all instruction fetches are taken relative to the CS register, using the instruction pointer register (IP) as an offset.

These are not particularly general-purpose registers, and here is where the 8086 falls down in comparison to the Zilog Z8000 microprocessor.

Memory

The Intel 8086 boasts a remarkable 20 address lines, which allow the 8086 to address over one megabyte (1,048,576 bytes) of address space. (That equals about 62.5 16K-byte memory boards.) Of the 20 address lines, 16 are time-multiplexed to act as the data bus.

For best performance, the memory would be arranged with the least significant byte of a 16-bit data word located at an even address, and the most significant byte at an odd address. That's the way the 8086 expects it. Instructions are fetched from memory as words; the bus interface unit (BIU in Fig. 1) loads the instructions into the queue as bytes for consumption by the EU.

In addition to the massive one megabyte of address space, the 8086 can be configured to address 64K 8-bit I/O ports.

The requirements for using this memory and I/O are very specific, and are best found in the Intel MCS-86 user's manual. Suffice it to say that memory space is not a problem with the 8086.

Instruction Set

The instruction set for the 8086 is divided into six functional groups: data transfer, arithmetic, logic, string manipulation, control transfer and processor control. Each of the first three functional groups is divided further into subgroups of instructions.

Data Transfer. Data transfer instructions are divided into four classes: general purpose, accumulator specific, address-object and flag. These instructions are used to move data to and from the 8086.

Arithmetic. The 8086 arithmetic instructions provide five basic mathematic operations: flag register settings, addition, subtraction, multiplication and division. These instructions have a number of varieties, including both 8- and 16-bit operations and signed and unsigned operations.

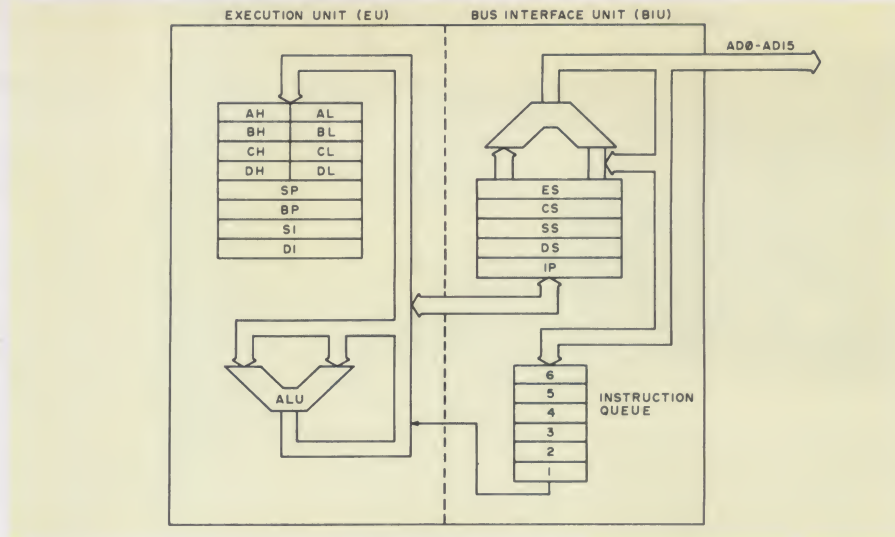


Fig. 1. 8086 architecture.

Logic. The 8086 provides basic logic operations for both 8-bit and 16-bit operands. In addition, it has three single-operand operations and four double-operand operations.

String Manipulation. The 8086 can manipulate byte or word strings with relative ease. The 8086's ability to repeat string operations within hardware is one convenient feature. Primitive one-byte instructions can be prefixed with a repeat number. Then, that instruction (or series of instructions) can be repeated n times, with no extra coding required. This feature can prove important when performing such jobs as code translation.

Control Transfer. The 8086 has four classes of transfer operations: calls, jumps and returns; conditional transfers; iteration control; and interrupts.

Processor Control. A variety of 8086 instructions control the processor. The 8086 can be halted, single-stepped and told to wait. Also, a one-byte prefix can precede any instruction to "lock out" any request to use the bus (as might occur in multiprocessor systems). During the time the 8086 is in this locked-out mode, all interrupts are masked. Interrupt requests are latched, but not acted upon until the lock prefix goes away.

Summary

The Intel 8086 was the first of the new generation of 16-bit microprocessors, and as such is probably better than the 8080A (If, indeed, you can compare the two).

Intel literature says that the 8086 can increase program execution speeds from seven to 12 times over the 8080A, while using 10 percent to 25 percent less code.

Also, the 8086's I/O capability should prove irresistible in any situation requiring an intelligent controller.

Z8000

Zilog's entry in the 16-bit microprocessor race is the Z8000. When I first looked over the Z8000 specifications, I was instantly reminded of that old workhorse of the minis, the LSI 11, from Digital Equipment Corporation.

The Z8000 (also produced by Advanced Micro Devices as the AmZ8000) is newer than the 8086 and shows it. The Z8000 has eight times the direct memory addressing capability (eight megabytes) of the 8086.

Architecture

The Z8000 is register-oriented. It has sixteen 16-bit registers, 15 of which are general-purpose, and an instruction set that supports over 400 combinations of instruction types, data elements and addressing modes. The Z8000 is simpler than the 8086 and resembles a minicomputer more than a micro.

Memory

Two versions of the Z8000 are available: a 40-pin version (called unsegmented) and a 48-pin version (segmented). The 48-pin de-

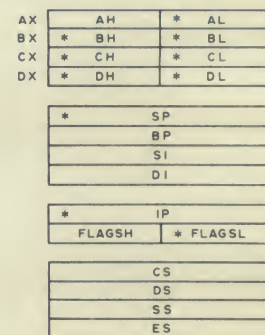
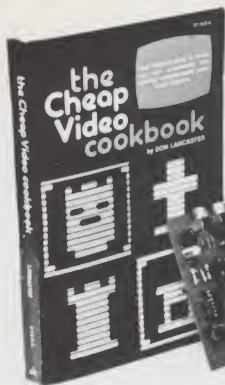


Fig. 2. 8086 register set. *indicates 8080 registers.



the ULTIMATE in CHEAP VIDEO

BOOK & KIT
ONLY \$42.95

Don Lancaster's "Cheap Video" concept allows almost unlimited options, including:

- * Scrolling: Full performance cursor.
- * Line/Character formats of 16/32, 24/80, 32/64.... or almost anything.
- * Graphics-up to 256 X 256 B&W; 96 X 128 COLOR (requires low-cost option modules)
- * Works with 6502, 6800 and other micros.

SPECIAL OFFER: Buy the Kit (upper case alpha-numeric option included) & get the Book at 1/2 price.

PDIA ELECTRONICS, 1020 W. WILSHIRE BLVD., OKLAHOMA CITY, OK 73116

I'm Sold, PLEASE RUSH..... () SEND FREE CATALOG

() TVT-65g Kit & Cheap Video Cookbook - \$42.95 ✓ 106

() TVT-65g Kit only (book required for assembly)-\$39.95

name: _____

address: _____

city: _____ state: _____ zip: _____

PDIA ELECTRONICS, Dept. 8K 1020 WILSHIRE BLVD., OKLAHOMA CITY, OK 73116



Dual Eight Inch Floppy Disk Drives.

Complete with power supply and all necessary cabling. Operates with single or double density controllers for up to 1 megabyte disk storage.

6400 bits-per-inch. 48 tracks-per-inch. 7msec. track-to-track access time. 500,000 bit-per-second transfer. Beige cabinet, 5" x 17" x 20 1/4".

Don't look now, but I think there's a wolf crying.

Electrolabs ✓ 345

P.O. Box 6721 Stanford, CA 94305 415-321-5601
USA 800-227-8266 Worldwide: TLC: 345567 Electrolabs PLA

Dealer inquiries invited.

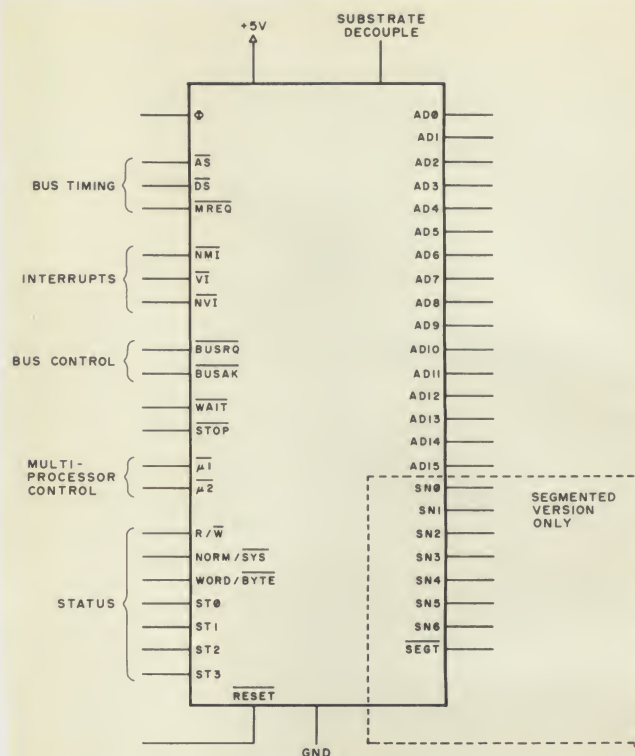


Fig. 3. Z8000 pin-out.

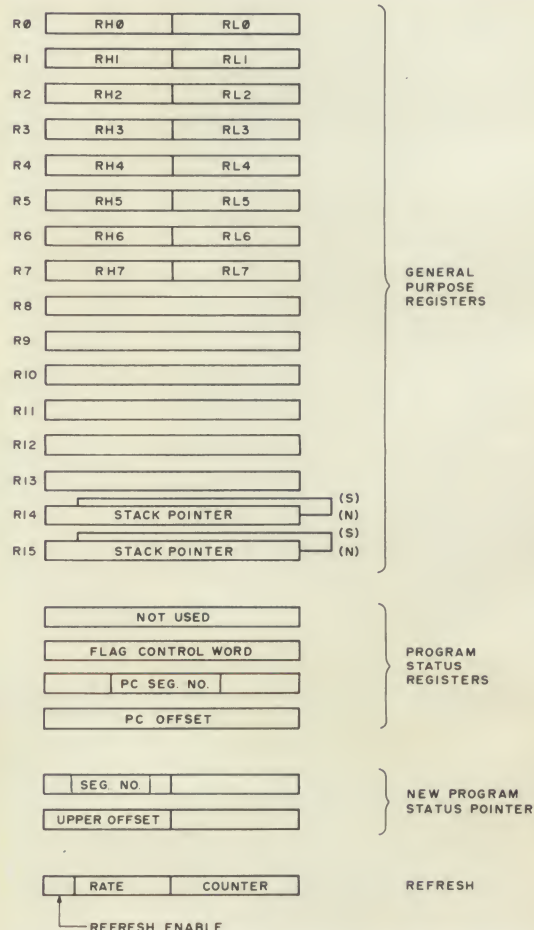


Fig. 4. Z8000 register set.

vice's extra eight pins increase its memory capabilities. I'll talk mostly about the 48-pin version. Remember that software written for the 40-pin version will run fine on the 48-pin version, but not vice versa.

The 48-pin Z8000 has the standard 16 address/data lines, much like the 8086 (see Fig. 3). In addition, the segmented version has an additional seven output pins (SN0-SN6 and SEGT) that extend the normal 16 address lines to 23 (SEGT is a control line). AD15 can address 64K addresses. If you use the segment lines SN0-SN6, you can point to 128 segments of 64K each. Using all 23 address lines, total memory is eight megabytes of address space (8,388,608 addresses, to be exact).

The basic data unit for the Z8000 is thought of as an 8-bit byte. It will as easily operate with 16- or 32-bit data words.

Back to the eight megabytes of address space. If, along with the Z8000, you purchase a memory management device, the memory capabilities of the Z8000 are multiplied sixfold. The memory management device (MMD) couples to the high-order address lines (AD8-AD15), the seven segment lines and the status lines (see Fig. 3). You end up with a chip set capable of directly accessing 48 million addresses. For all practical purposes, this is virtual memory. This all adds up in the following manner:

AD0-AD15 = 64K
SN0-SN6 = 64K x 128 = 8 megabytes
Status lines = 6 x 128 x 64K = 48 megabytes

The status lines serve to divide memory into system code space, normal code space, system data space, normal data space, system stack space and normal stack space. Each space can be addressed by a 23-bit address.

Aside from producing a huge address space, the MMD provides some other advantages. Consider the effort required to keep track of 48 million addresses. It is a monumental task at best, impossible at worst. Fortunately, the MMD, along with the Z8000 instruction set, does most of the work for you.

System/Normal. Recall that the status lines divide memory into system and normal code, data and stack space. The Z8000 can differentiate between your operating system code (system) and the code you're working on (normal). This allows the Z8000 to protect your system code from accidental alteration.

Addressing Structure. Addressing with the segmented version of the Z8000 is easy to do. The segment lines (SN0-SN6) establish a base address, pointing to one of 128 segments. The 16 AD0-AD15 lines point to a specific location within the addressed segment. The Z8000 registers are, therefore, designed to handle addresses in the same fashion.

**STOCK
CONTINUOUS
CHECKS & STATEMENTS**

We Carry Forms Specifically
Designed for These Software Formats

- LIBRA • DURANGO • DIBS •
- STRUCTURED SYSTEMS • DIGITAL SYSTEMS •
- BRIAREUS • TIMBERLINE • PEACHTREE •
- TCS • RADIO SHACK* • SOME OSBORNE •

Low Minimum Orders • Fast Delivery • Quantity Discounts

SEND FOR YOUR FREE SAMPLES TODAY!

The Best Choice for the Small Computer User

NATIONWIDE
SERVICE

FREIGHT
INCLUDED

- * Personal Checks
- * Payables Checks
- * Payroll Checks
- * Combination Checks
- * Statements
- * Invoices



**Checks
To-Go** ✓ 58

* Registered Trademark of Tandy Corp.

8384 Hercules St., La Mesa, CA 92041, (714) 460-4975

TRS 80

TRS-80 Model I



Level II 16K. 26-1056

699

MODEL 3
call today!

Model II



64K, 1-Disk TRS-80
Model II System

\$3499

**We accept check, money order or phone
orders with Visa or Master Charge.
(Shipping costs added to charge orders).**



CHARGE IT

Computers Unlimited

1524 OAK HARBOR ROAD, FREMONT, OHIO 43420

419-332-4881

✓ 26 **Collect**

TRS-80 is a Trademark of Tandy Corp.

Registers

The register structure of the Z8000 is one of its strong points. Fig. 4 shows the Z8000 register set. The 40-pin version has two stack pointers: a system stack pointer and a normal stack pointer. The 48-pin version has four stack pointers: 32 bits for normal operation and 32 bits for system operation. In the 48-pin version, 16 bits of the 32-bit stack contain the segment number, while the offset value is contained in the remaining 16 bits.

General-purpose registers. The Z8000 has 16 general-purpose registers, labeled R0 through R15. Each register can contain 16 bits of information. In addition, R0-R7 can each be divided into two 8-bit registers (RH0, RL0, RH1, RL1, etc.).

Word registers 32 bits long can be constructed from pairs of general-purpose registers (e.g., R0-R1, R2-R3). And 64-bit registers can be constructed from register quads (e.g., R0-R1-R2-R3, R4-R5-R6-R7). The 64-bit register quads are required by instructions such as Multiply and Divide.

Stack pointers. In the 40-pin non-segmented Z8000, R15 is doubled to act as the stack pointer (normal stack, system stack). In the 48-pin segmented Z8000, R14 and R15 are doubled to act as stack pointers (R14 contains the segment number, R15 the offset value).

Flag control word. The flag portion of the flag control word is the same for both versions of the Z8000. The flags used include carry, zero, sign, parity or overflow, decimal adjust and half-carry.

The control portion of the flag control word differs between the segmented and non-segmented versions. Control bits include vectored interrupt enable, non-vectored interrupt enable, stop mode, segmentation enable (48-pin version only) and system/normal mode.

Program counter register(s). The non-segmented version of the Z8000 has one 16-bit program counter register. The segmented version has two 16-bit program counter registers: the first holds the segment number, the second holds the 64K offset value.

New program status area pointer. This register contains the memory location of new program status words for the Z8000. In the non-segmented version, this register points to an address using only the upper eight bits of the 16-bit address bus. In the segmented version, two registers are used. One points to the segment number; the other points to the upper eight bits of the address.

When an interrupt or program trap occurs, the old program status words are pushed onto the system stack (identified by the system stack pointer register). New status words are fetched from the new pro-

gram status area pointed to by the new program status area pointer register(s).

Refresh register. Refresh is a little less of a headache with the Z8000 than with the older microprocessors. A counter within the Z8000 automatically refreshes the dynamic memory. You can set a special memory refresh access at programmable intervals.

A programmable prescaler (a 6-bit modulo-n counter) is driven at one-fourth the system clock rate. The refresh register is nine bits wide and is automatically incremented by two each time the prescaler times out. This allows up to 256 rows of memory to be refreshed. The refresh feature can be disabled if necessary.

Instructions

While developing the Z8000, Zilog determined which instructions were used most often. Zilog then took these statically frequent instructions (the instructions most often found in a listing) and reduced the number of words required to execute them. Less code density was the result.

Some 110 distinct instruction types are used by the Z8000. Each instruction is divided into four (more in certain operations) basic fields. Those fields include mode field, indicating the addressing mode; the opcode field, indicating the instruction; the data element type, the byte or word designation; and register designation field, designating the register used in the instruction. An instruction can require from one to five words, depending upon its type and addressing mode.

Data types. The Z8000 can operate on five data types: BCD digits (four bits), bytes (eight bits), words (16 bits), long words (32 bits) and byte and word strings.

The byte is the basic data element. The number of bytes in any instruction is implied in the instruction, or in some cases is explicitly detailed by the programmer.

Bits, bytes and words (both 16 bit and 32 bit) are manipulated within the Z8000 registers. Byte and word strings, however, are stored in memory. String manipulation is eased by the use of the Z8000's auto increment/decrement addressing feature.

Instruction addressing modes. The Z8000 uses five main user-selectable addressing modes: register (R), indirect register (IR), direct address (DA), indexed (X) and immediate (IM).

In addition, several other modes are used for certain instructions: base address (BA), base indexed (BX), relative address (RA), auto increment and decrement.

Multi-processor capability. The Z8000, like the 8086 and MC68000, is specifically designed to work in a multi-microprocessor environment. The Z8000 has two pins included to ease multi-processor functions (see Fig. 3). The $\mu 1$ input disables the Z8000,

while another processor is using a shared resource. The $\mu 0$ output lets the Z8000 prevent another processor from taking the bus if the Z8000 is using a critical shared resource.

Multi-processing is becoming more and more an economical prospect. The price drop in microprocessors versus their increasing power means that there is no reason to load one processor with all the work, when several can do the job better.

Summary

The Z8000 is, above all, a general-purpose machine. With its large addressing capabilities, its most common use will probably be in mainframe minicomputers, competing with DEC. The Z8000 is an advanced machine, but don't let that overwhelm you. The Z8000, like the other 16-bit processors, isn't any more difficult to understand than your 8080 or 6800. It's just a little bigger.

If you are interested in getting the complete story on the Z8000, get in touch with your local Zilog or Advanced Micro Devices representative.

MC68000

Now we come to the mystery machine. During its development, Motorola kept a tight lid on the MC68000. Now they're ready to send out small quantities for evaluation, though you still can't order more than ten. Motorola is rationing the MC68000 for fear that a few big buyers will snatch up 90 percent of their stock for the next year.

Architecture

The MC68000 appears to have been worth the wait. By using a HMOS fabrication method, Motorola has managed to put over 68,000 active devices on their wafer, as opposed to the 8086's 29,000.

The MC68000 comes in a 64-pin package like the T.I. TMS9900. Unlike either the 8086 or Z8000, the MC68000 has separate address and data pins. But like the 8086, the MC68000 is a pipeline processor. Recall that the 8086 fetches instructions before it actually needs them. The same thing happens in the MC68000. One half of the device performs instruction fetches, while the other half executes the instructions. Here again is an example of pipeline processing, something you'll be seeing a lot more of.

Registers

You will find sixteen 32-bit registers in the MC68000 (Fig. 5). They are divided into two groups: eight registers for data and eight for address.

The data registers can be used for byte, word or long-word data operations. The address registers are typically used for stack pointers and base address registers. In certain situations, the address registers can

INTRODUCING THE EMULATOR™

The trouble with video terminals today is that most of the low-cost models just don't have the performance to handle your tough applications. And the few that do are usually not compatible with your existing system. But now, Intertec has resolved this age old dilemma with the introduction of its new Emulator™ Video Terminal.

The \$895* Emulator™ performs exactly as you command. With the depression of just a few keys, Emulator users can select terminal control codes of any one of four popular video terminals. The Lear-Siegler ADM-3A. The Soroc 1Q-120. The DEC VT-52. Or the Hazeltine 1500. Incredible! It's like having four terminals for the price of one.

But, best of all, not only does the Emulator replace these terminals, it outperforms them by offering enhanced user-oriented features. Features that those other terminals just don't have - at any price.

Standard Emulator™ features include: a sharp, crisp 12" non-glare screen with a full 24 line by 80 column display. Twin RS232C serial ports - one for the host computer and one for your printer. Four separate cursor control keys. A separate 18 key numeric pad. Keyboard selectable baud rates and operating modes. And, a host of visual attributes.

No matter which dumb or smart terminal you're using today, don't buy another until you check out our new Emulator™. You'll get the

performance of four terminals for the price of one. And you'll probably save hundreds of dollars over the price you paid for your last terminal. Plus, you'll get unparalleled reliability, nationwide service and quick delivery. Call or write us today for all the details. Intertec terminals are distributed worldwide and may be available in your area now.

 **INTERTEC
DATA
SYSTEMS®**

2300 Broad River Rd. Columbia, SC 29210
(803) 798-9100 TWX: 810-666-2115

✓ 343



*Quantity one - Dealer inquiries invited.

also serve as word and long-word data registers.

As a side note, some believe that the MC68000, with its 32-bit registers, will act as Motorola's bridging processor into the 32-bit mini field. We'll have to wait and see. Notice in Fig. 5 that the eighth address register is actually doubled. The A7 register acts as the stack pointer for the MC68000. And the stack pointer is doubled, as in the Z8000, into a user (normal in the Z8000) and supervisory (system in the Z8000) register.

The program counter register is 24 bits wide, allowing the MC68000 a memory addressing range of 16 megabytes (16,777,216 addressable locations).

The status register has some interesting features, too. This 16-bit-wide register is divided in half. The user byte contains the normal status information you would expect to see. The system byte contains three bits for the interrupt mask, one bit to indicate a user or supervisory operating mode and one bit to indicate a trace mode.

Trace. The trace feature is unique to the MC68000. When the trace mode bit is set, the MC68000 traps to a tracing routine (that you write) after each instruction is executed. This valuable tool is like a built-in debugging feature. You can use trace whether you're operating in the user or supervisory mode, but you can only enter trace mode from the supervisory.

According to Motorola, the unused bits in

the status register are for future expansion. Maybe they'll convert the MC68000 into a 32-bit machine.

Memory

The MC68000 has 23 address lines, labeled A1-A23 in Fig. 6. Notice that the MC68000 doesn't have an address line A0; the data bus is controlled in a byte-oriented fashion. That is, there are two control lines on the MC68000 called upper data strobe (UDS) and lower data strobe (LDS). These two lines remove the need to ever use the least significant bit of the address bus.

Motorola plans on making available a memory management controller that will handle memory segmentation and protection, much like the Z8000's memory management device.

Instructions

Motorola has taken a number of steps to enhance the MC68000 instruction set.

First, the MC68000 instruction set is a super-set of the old MC6800 instruction set. This was done to ease translation of 6800 code to MC68000 code. A translator will be available to perform this upgrading task.

Second, Motorola performed the same research Zilog did to look at statically frequent instructions (those instructions that occur most often in a program listing). But Motorola went a step further and looked for dynamically frequent instructions (those in-

structions that are most often executed). Keeping the numbers in mind, Motorola tried to create instructions that were as short as possible.

Third, Motorola prepared for the emergence of modularized high-level languages, such as Pascal. Several specific instructions in the MC68000 instruction set are geared directly for structured languages such as Pascal. Instructions such as LINK and UNLINK allow linked data lists to be manipulated within the stack areas. There are other examples, but the point is that the MC68000 hardware is set up to use structured languages efficiently.

There are 59 distinct instruction types in the MC68000 instruction set. Each instruction, with a few exceptions, will operate on data bytes, words and long words. And most instructions use any of 15 main addressing modes. If you combine the instruction types, possible addressing modes and data types, you end up with about 1000 distinct instructions.

And yet, with all those possible instruction combinations, the basic instruction list is easy to remember. If you can program a 6800 without having to look at the book all the time, you can probably program an MC68000 without looking.

As with the other 16-bit microprocessors we've discussed, the MC68000 will perform signed and unsigned multiply and divide operations in hardware, thus speeding arithmetic program execution. The microprocessor can deal with BCD arithmetic, as well as standard binary integers. The new MOVE data instruction will allow you to transfer bytes, words and long words in all data addressing modes.

Speaking of addressing modes, the MC68000 has five basic types: register direct, register indirect, absolute, immediate and program counter relative.

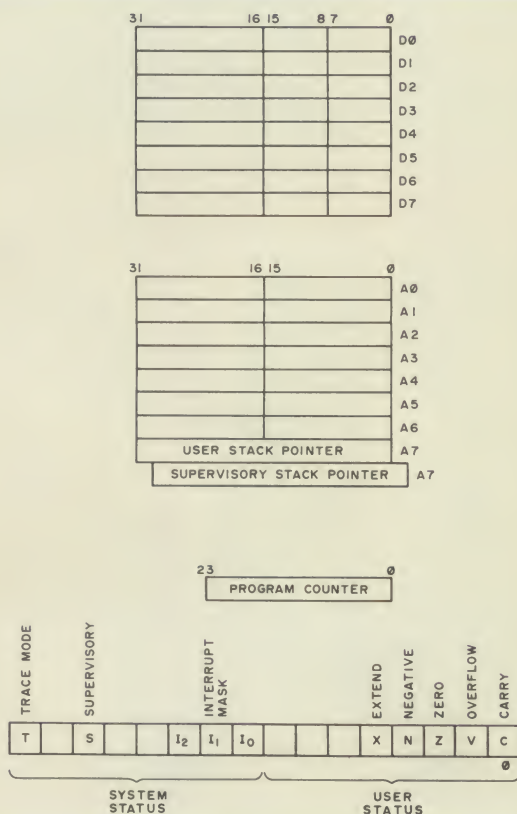


Fig. 5. MC68000 register set.

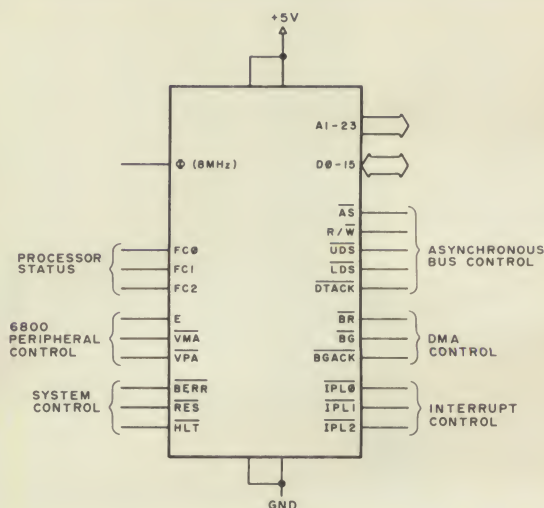


Fig. 6. MC68000 pin-out.

In the register indirect addressing mode, the MC68000 has two sub-modes called post-increment and pre-decrement. Here again, as in the Z8000, the MC68000 has enhanced data string manipulation capabilities. Overall, there are 15 addressing modes of operation.

Three pieces of information are required in an MC68000 instruction: the location of the operand(s), the size of the operand (byte, word, long word) and the function to be performed.

The MC68000 will operate with dual operands. The location of the operand in memory is either explicitly specified in the instruction or implied by the instruction as addressing modes.

This short explanation of the MC68000 instruction set does not do justice to the wide range of instruction possibilities, and I suggest that you seek out more information from Motorola if you're interested in the MC68000.

Support

The 8080, Z-80, and 6800 have a lot of support devices. Rather than design totally new devices for the MC68000, Motorola decided to implement the existing chips. Almost all of the 6800 family of peripheral devices can be used (in pairs, usually) with the MC68000. The VMA, E, R/W and RESET lines on the

MC68000 are used exactly as they are on the 8-bit 6800. This means that you don't have to learn new peripherals as well as a new microprocessor when you use the MC68000. As far as I'm concerned, this is a big plus for Motorola.

Summary

I'm short-changing you in this brief outline of the MC68000. It is a remarkable device, and Motorola has apparently put a lot of forethought into its design. Literature describing this microprocessor in more detail will be available soon.

At this writing, Motorola is experiencing difficulty with the design of a buffer register within the MC68000. It doesn't want to pass data accurately. This will undoubtedly be cleaned up before the device gets into mass production.

What Does All This Mean to You?

First, does this mean 16-bit microprocessors will replace our reliable 8-bit processors? No. The 8-bit machines are too well entrenched to be dislodged by an increase in data length. After all, some 4-bit microprocessors are still around, used in simple control applications.

A plan is now before IEEE to adopt the S-100 bus, with provisions for a 16-bit-wide data bus. If this goes through (as it probably

will), then S-100 will become standardized and will be capable of handling the new 16-bit processors.

The current outlook is that these microprocessors will be used in mini-type applications. They require massive memories to take advantage of their architecture. The part-time hobbyist may not want to become involved with the 16-bit processors. After all, purchasing 48 megabytes of memory is costly.

But if you're interested in plain old number crunching, with the maximum possible throughput, then you should definitely investigate this new breed of microprocessor. Speed is increased merely by doubling the data size for each instruction used. Other enhancements are included in the 16-bit machines, too. Long-word multiplication and division in hardware certainly won't hurt anyone's feelings.

Should you look into the 16-bit microprocessor? You bet! But if you decide to start implementing 16 bits, don't treat them any differently than your 6800. Use the expertise you've developed with 8-bit machines, and don't let the whiz-bang numbers fool you.

We're entering a new era in microprocessors (we seem to do this about once every three years). This will probably be a short era too. Next? 32 bits. In the meantime, let's sit back and watch the 16-bit revolution. ■

HARD COPY

AT

Soft Prices

* OKIDATA *

Microline 80 Features

- Program-selectable fonts
- 80 and 132 columns
- 6 and 8 lines per inch
- Continuous operation — 100% duty cycle
- 200,000,000 character head warranty
- 2,000,000 character ribbon warranty
- Full 96 character ASCII
- Microprocessor-controlled interfaces
- 14 pounds light
- Pin, tractor and friction feed forms
- Standard 1, 2 and 3 part paper
- Graphics

LIST \$945 \$800

YOUR COST \$745.00 \$600

BUY DIRECT & SAVE \$200.00

BUY DIRECT FROM THE
"Stocking SOURCE"

* ANADEX *

Anadex AN Printer Model DP-8000

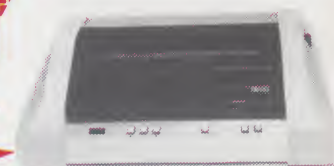
- Features
- 80 Columns, 112 cps
- 84 Lines Per Minute, Bi-Directional, Nominal Thruput
- High Reliability — Heavy Duty Cycle, 100 M Characters Print Head Life
- Sprocket Feed
- Paper Entry Through Bottom or Rear
- 9 x 7 Character Font
- Variable Form Width

LIST \$1095.00

YOUR COST 895.00

BUY DIRECT & SAVE \$200.00

APPLE VERSION . . . 895.00



ANADEX DP-9500

Features

- 132/220 Columns
- 9 Wire Print Head
- 650 Million Character Life
- 150/200 CPS
- 11x9/7x9 Character Font
- High Density Graphics
- Black Long Life Ribbon Cartridge
- Original Plus 5 Copies
- Many More Features

LIST \$1650



**WE ARE A
FACTORY
AUTHORIZED
FULL SERVICE
CENTER**

✓ 288

TO ORDER
CALL COLLECT
(313) 477-7586

OR

WRITE TO "THE STOCKING SOURCE"
23995 FREEWAY PARK DR.
FARMINGTON HILLS, MI 48024



Micro-Matrimony

Can a law firm find happiness with a Sol 20 computer system?

Frank J. Derfler, Jr.
PO Box 691
Herndon, VA 36117

The marriage between the law offices of Piel and Lynn in Montgomery, Ala., and their Sol 20 computer system is one that has worked.

For less than \$12,000, the firm has an electronic helpmate that does collection letters, divorce papers, incorporation papers and bylaws. It processes real estate closings in half the time it used to, and has reduced the time needed to prepare a will with a trust from two or three hours to 25 minutes.

And, says attorney Richard Piel, the system paid for itself in the first few months of operation.

Use of the Sol 20 revolves around the

Word Wizard, a word-processing program from Processor Technology. Since paper is the major physical output of a law office, the computer was put right on the production line.

The disk files are loaded with documents and standard forms. The correct form is called from the file, the CRT fills in the blanks, and a Diablo printer produces the document. The result: a customized document that looks like an original.

Entering each document the first time takes a lot of work, and system operator Glenda Senn uses numerous control codes. She has taken one data processing course, and the rest of her training is on the job.

Buying the microcomputer was a family effort involving much research, says Piel. The firm spent two years looking for a system that would meet its needs economi-

cally. Many systems were available, but most dedicated word processors were expensive and rigid. They often controlled, rather than helped, office procedures because of a feeling that maximum use should be made of the expensive equipment.

Piel and Lynn do not do the actual number crunching of figuring accounts on the Sol. The system is used to address envelopes and print the bills. Piel is convinced that timely billing is the key to prompt payment, a viewpoint many businesses can appreciate.

The firm does not do accounts receivable or office typing on the system; much work is still done on standard office machines.

The key to the firm's success, says Piel, is that the company knew what it wanted. While local free-lance software people are looking at more uses for the system, anything the firm buys will have a fixed price and a specific purpose. The firm, says Piel, bought the computer system with realistic expectations, and was not driven by a need to get a return on a large investment.

Piel and Lynn's successful use of a relatively low-cost microcomputer system has several lessons for other small businesses thinking about a similar move.

- First, determine exactly what you want the system to do.
- Then, shop around. Do not be lured by pretty hardware.
- Buy general programs for a predetermined price.
- Put in some time setting up the proper forms.
- Do not let the system dictate the way you do things.
- Finally, be happy if you meet your original goals.

As in all marriages, realistic expectations and formal understandings of roles and responsibilities are necessary. It probably will not always be a bed of roses, but a warm relationship with a microcomputer can lead to unexpected delights. ■



This Sol 20 system found a happy home with a law firm. It greatly shortened the time needed to prepare legal documents and met all initial expectations.

CONSULTANTS WANTED

Earn \$200 to \$400 per day and enjoy more independence working as a professional consultant. The computer industry's needs for qualified consultants are at an all-time high. A fast way to start is to get listed in the NATIONAL REGISTER OF COMPUTER CONSULTANTS AND SOFTWARE HOUSES. The 1980 edition of the REGISTER will be published July 15. Write or phone (without any obligation) for Registration Form and Profile Card.

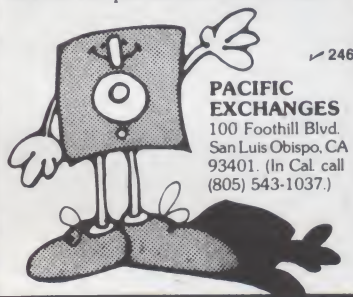
ESSEX PUBLISHING CO.
285 Bloomfield Avenue
Caldwell, N.J. 07006
(201) 783-6940

✓ 342

MEMOREX DISKETTES & CARTRIDGES

for your computer or word processor

BUY THE BEST FOR LESS.
Lowest prices. **WE WILL NOT
BE UNDERSOLD!!** Buy any
quantity. Call free (800) 235-
4137 for prices and information.



✓ 246

**PACIFIC
EXCHANGES**
100 Foothill Blvd.
San Luis Obispo, CA
93401. (In Cal. call
(805) 543-1037.)

SURPLUS ELECTRONICS

ASCII



ASCII

**IBM SELECTRIC
BASED I/O TERMINAL
WITH ASCII CONVERSION
INSTALLED \$645.00**

- Tape Drives • Cable
- Cassette Drives • Wire
- Power Supplies 12V15A, 12V25A, 5V35A Others, • Displays
- Cabinets • XFMRS • Heat Sinks • Printers • Components

Many other items.

✓ 122

WORLDWIDE ELECT. INC.
130 Northeastern Blvd.
Nashua, NH 03062

Phone orders accepted using
VISA or Master Charge
TOLL FREE
603-889-7661 • 1-800-258-1036

*A trademark of the Tandy Corporation



**A year ago, when nobody had ever
heard of me, I said these disks could turn
a TRS-80* into a serious computer.**

**Now they tell me I'm "the standard
of the industry."**

I'm Irwin Taranto, and times have changed.

In the first twelve months, almost a thousand businesses put me to the test.

You can buy my TRS-80 systems all over the country — dozens of companies sell them. Some are my dealers, some aren't. And this creates a new set of problems.

You see, learning to use a computer — any computer — is like learning anything else. It takes some getting used to. If you sit down with a computer program and the manual and try to figure it out all by yourself, you'll probably just give up and feel you've been had.

You have to hang in there for a month, make a few phone calls, and have somebody who really understands the system help you work it out.

That's why I still answer the phone. And why, I guess, people say all those nice things.

The Model I systems

So far, I have six systems for the Model I, at \$99.95 each, plus \$20 each for the books where required. For the Cash Journal option on the General Ledger, add another \$50.

Accounts Payable
Accounts Receivable
Invoicing
General Ledger (Cash Journal optional)
Payroll
Inventory Control

And the Model II programs

Some brand new, highly-sophisticated programs for the TRS-80 Model II, at \$249.95 each, plus \$20 for the book where required.

General Ledger/Cash Journal
Accounts Payable/Purchase Order
Accounts Receivable/Invoicing
Payroll/Job Costing

For the Model I programs, you can tell us what you need in a letter or by phone. You get the disk and all the instructions you need. Any problems, just call me.

For the Model II programs, I ask you to fill out a questionnaire before I send you any materials. The systems have so much flexibility we tailor them to your needs.

That way, I make sure you get a system that works. If you have any doubts about that, I'll give you the names of some people in your area who've already been through the process.

Let them tell you whether I really deserve that fancy new reputation.

Taranto

✓ 279 & ASSOCIATES, INC.

P.O. Box 6073, 4136 Redwood Highway, San Rafael CA 94903
(415) 472-2760. Add \$3.50 per order for handling. 6% sales tax in California only. Master Charge, Visa, C.O.D.

Winning the Micro Game

Dilettantism won't do when it comes to learning about microcomputers.

Don Lancaster
Synergetics

Hands on is everything. The only way to ever learn anything about computers is to jump in with both hands and feet, get on line and do some computing. Until you actually do and see what the micro world is about, you've accomplished nothing. You must do things yourself, on your own terms, in front of a working, real computer, alone.

It's both funny and sort of sad to hear a student say he just took a DP course but couldn't get any CPU time. *He* got taken, not the course.

You become computer literate by using computers, not by having someone tell you about them or by reading about them.

Understand a timing loop by writing one and watching it work. Do an interface by taking a triac, an optocoupler and a 100-Watt light bulb and shining light on the real world. Find out what an interrupt is by interrupting a computer. Do it—yourself.

You have to make mistakes. If you are learning micros or developing any new product, half your experiments should fail. A canned set of exercises on a micro trainer is next to worthless if everything falls into place and works perfectly the first time.

In the micro world, you make mistakes to learn and to progress. You should expect mistakes. Prepare for them. Welcome them. Aggressively seek them out.

Of course, it makes sense to never make the same mistake twice. Build on what you have. To expand your microcomputer universe, try new things that may fail. Find

out why they fail, and use this as a newer and bigger base to work from.

Usually, you are never anywhere near where you think you are in solving any hardware or software problem. Unexpected surprises and plain old stupidity are always between you and reality. If you think you have something working perfectly, you probably don't even understand the problem.

You must mix hardware and software. Some heads-in-the-clouds pure software people out there still believe that hardware is a mundane inconvenience standing between them and pure "computing." And there are technician types who do everything with bushel baskets full of integrated circuits.

Neither approach is good. Sometimes a simple and inexpensive hardware circuit can replace bunches of software. Other times and other places, a few lines of elegant software can eliminate the need for custom circuits or a special device.

Winning computer products will combine both hardware and software, using the best features of each to give you the simplest system and the lowest possible cost.

This means that if you are a hardware person, you should learn programming and learn it fast. If you have a software background, start soldering and wire-wrapping with a vengeance.

Synergy says that $1 + 1 = 4$. This is definitely the case when you get an optimum mix of hardware and software interacting with each other.

Neither can stand alone—not any longer.

The real world is fuzzy. Some textbooks and lab experiments work every time.

Everything is nice and clean, neatly tied up. You do exactly what you need to do the job, no more, no less. Unfortunately, reality doesn't work that way.

First, you must deal with people, and that will always mess things up. Key items will be missing or late. The magic chip may be a figment of an ad writer's dreams. Or a problem may have a simple and inexpensive technical fix that is politically or socially unacceptable. Goals conflict. So do egos.

Expect and accept fuzziness. As you get into a new computer area, things will start out completely confusing. Then they will become fuzzy. Then they will become, for a glorious instant, crystal clear. Then, of course, they get fuzzy again as you become more involved.

As you go to the bigger picture, expect more fuzziness. Also recognize that there really isn't much in the way of real-world beginnings and endings. Rather, things sort of dribble off into the great whatever.

Micros might—just might—be the missing link between people and intelligent life in the universe.

Hit the basics hard. Any 6502 micro freak can sit down and immediately "prove" that the 6502 is ten times better than any other micro in the world. The trouble is that you can do the same with any other micro family, as well.

For most micro uses, it makes no difference which micro from which family you use. Even if there temporarily was a "best" micro, other factors such as your own skills and attitude, the available software, the elegance of your competitors' programs and so on will reduce any advantage of the "best" micro to zilch.

If you don't happen to like the "best" micro, just wait a month or two, and it will get shot out of the saddle by something much more promising.

This all means that the micro you learn is not the micro you will use. Later on, there will be much better ones to work with, and they are sure to have completely different tech details.

To beat this, hit the basics hard. All known micros have address space and addressing modes. All have interrupts, subroutines, clocks, ports, memory and I/O. Use any micro you like to add tech details to the fundamentals. But get the essentials down solidly.

Reach out and put the touch on someone. The nickels in the micro world are now to be made in places where people are not yet using micros. Find these places and get involved with these areas and people on their own terms.

Put micros to work feeding cattle, treating sewage, gambling on Wall Street, designing looms, mixing cement, baking calzones, milking goats, hulling pecans, questing tinajas, animating video, co-oping groceries, hybridizing silensmilla, improving wood stoves, redesigning bicycles, restoring steam calliopes, monitoring steam gauges, selling paper clips, cutting dress patterns and teaching trumpets.

When you do reach out, always work in the other person's terms and language, bending the micro info to fit as you can. If they are smart enough to learn micros, they won't need you for anything.

Find places where they don't yet know that micros can help. Then jump in.

Don't reinvent the wheel—steal the plans instead. Much of the needed and obvious micro-related information has already been done and is readily available for your use. For instance, if you want to drive a Teletype or another printer, use someone else's driver routine. Don't stop what you are doing and invent your own—unless you truly want to know how a driver program works.

Scads of Morse code trainer programs are out there. Why write another? The same goes for sorts and word justification subroutines. And there are more versions of Lunar Lander than there are moons in the solar system. How many Hangman, Hex-pawn or NIM games have you seen?

Now, if you want to learn these programs, that's fine, but, if your goal is using something, rather than creating something, find out what has already been done and go with it, or improve it and then go with it. Refer to monitor listings, user software exchanges, micro magazines, application notes, club newsletters, program books and micro information exchanges for programs to use.

Better wrong now than right later. In

anything you do in the micro world, your first attempt will be wrong and will have to be reworked. So, immediately kludge up your first attempt and let your mistakes show you the way to go. Often you don't even understand what the real problem is until you are inside a program or a wire-wrap board looking at it.

Try a simple, quick and dirty tactic that at least sends you in roughly the direction you want to go. Make some guesses. Take a stab at it.

In your early attempts, if it works, use it. Start your project flying more or less right-side up. Later on, you can go back and add structure to your programs, elegance to your methods, convenience to your user and simplicity to your hardware.

Add the final spit-and-polish on the way out the door, and not early in the game.

Write it down. And not on the back of an old envelope, either. Documentation is the

aren't supposed to smile while you are playing their games.

Simon says don't smile. It's still a game. Have fun.

You will never get enough. No matter how far you have gone in microcomputing and no matter how much of what kind of hardware and software you have on hand, you will always "need" more of something.

More memory? Start with a 1K trainer, then 4K, then a 16K micro. Then overfill the 16 megawords of an extended micro space. Need hard copy? Start with Excedrin headache number ASR-33, then on to thermal, a Selectric and finally a daisywheel.

Now, if only daisy was intelligent and had its internal word processing.

From plain-jane video, go on to graphics, color graphics, hi-res and then super-resolution color with gray scale. From cassettes, it's on to floppy, dual floppies, quad density and then a Winchester.

You can learn far more about micros watching fourth graders zap Klingons than you ever will in a university COBOL course.

password to avoid self-destruct modes. You don't record only final programs and schematics. Instead, keep track of what you did and why you did it, neatly, and in some semblance of order.

Keep accurate records of where you have gone and where you are heading. Put together the files of literature, instructions, op codes and program bits and pieces.

Software is worthless if you can't show someone else how to use it. Hardware has no way to operate if there's no way to connect it or fix it. You must be able to go back and reuse or modify what you did a week or a year ago.

Documentation is not just a hex dump; it's a micro way of life. You cannot survive without it.

Don't separate work from play. Which of these is more important: Designing an efficient sort algorithm for a business general ledger program or figuring out what to do with the oily slime in Adventure?

In the long run, the oily slime is far more important because that's what is stimulating interest in micros and making people computer-literate.

Any program run on a computer is a game! However, stuffy institutions, banks, bureaucrats and other so-called "serious" computer users have rules that say you

There never is, nor will there be, a time when you have "enough" of anything. What looks like a light at the end of the tunnel is a train speeding towards you.

You will find only one way out of the "more" syndrome. Always go with what you have. Make it work. Live with it as long as you can. Force it to pay its own way.

Make it do. Use it up. Wear it out.

If it's old line, stomp on it. Some pre-micro people and institutions are still kicking around the lunatic fringe of the new micro world. They persist with large, bureaucratic, centralized, insanely priced and unavailable megacomputers run by an elite priesthood singing the incantations of an arcane language. They completely fail to recognize the power of the micro as a highly personal, one-to-one, decentralized, inexpensive, interactive and individual convivial tool.

You can learn far more about micros in twenty minutes watching a pair of fourth graders zap Klingons than you ever will in a university COBOL course.

Old-line conventions include IBM, batch processing, COBOL, decollators, Honeywell, key-to-disk, FORTRAN, keypunches, centralized billing and data encryption. They are without any redeeming social value. They had their chance and blew it. We

Designed for your . . .
TRS-80™
the **PHOTOPoint™** Light Pen*
*a whole NEW concept in
computer application*

- Just plugs into your TRS-80 with disk or without! (Does not void warranties.)
- Programs with 3 lines in Basic!
- Comes with two Programs
- Complete Instructions!!
- Just point to play!
- Often eliminates confusing keyboard from games, education, or multiple choice.

All you need to get up and running the same day you receive your PhotoPoint is included. For only . . .

\$19.95 Order NOW from
Complete MICRO MATRIX
P.O. Box 938
Pacifica, CA 94044

*Dealer inquiries welcomed!

✓ 66

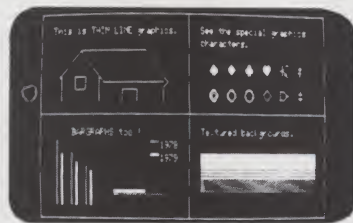
VERONA™

If you are an 8080 Assembly Language programmer, VERONA will help you write better programs in less time. VERONA is a terminal oriented, dictionary based, user extensible assembly language programming utility. Use VERONA to quickly produce programs for software design checking or for hardware troubleshooting. VERONA puts the full power of the processor at your fingertips, giving you an ability to interact with your system that you never had before. For ISIS, CP/M, and others. From \$40.

FBE Research Company Inc. ✓ 206

P.O. Box 68234 • Seattle, WA 98168

LOWER CASE & GRAPHIC SYMBOLS GENERATOR KIT FOR TRS-80™ CG 16 \$94.50



TRUE 2 LINE DECENDER LOWER CASE, ELECTRONIC SYMBOLS, THIN LINE GRAPHICS, GAME SYMBOLS, TEXTURED BACKGROUNDS AND MANY MORE. DEMO CASSETTE IS INCLUDED. FULLY ASSEMBLED WITH DETAIL INSTRUCTION FOR EASY INSTALLATION. REQUIRES ELECT PENCIL TYPE L.C. MOD OR ORDER MEMORY AND SWITCH KIT. SMK. FOR \$18.50

ADD \$2.50 FOR S. & H. CALIF. RES. ADD 6% SALE TAX. SEND CHECK OR MONEY ORDER TO

G.P. ASSOCIATES ✓ 187
P.O. BOX 22822, SACRAMENTO,
CA 95822



RS232C Computer compatible Paper Tape Transmitter/Model 612

Stops and starts on character at all speeds, uses manual control or X-on, X-off 90-260 volt, 50-60 Hz power. 50-9600 baud, up to 150 char/sec synchronous or asynchronous; gated internal or external clock, RS 232C, current loop or parallel output, reads 5-8 level tape, 7-11 frames per character, even or odd parity. Desk top or rack mount.

Addmaster Corporation, 415 Junipero Serra Drive, San Gabriel, CA 91776, (213) 285-1121, Telex 674770 Addmaster SGAB ✓ 261

tried it their way and it didn't work.

Old line not only fails to see the problem; they are the problem.

Always ask, "Why are you telling me this?" The useful products and ideas in the micro world are not heavily advertised. In fact, anything genuinely useful takes a lot of time and trouble to nail down.

If a micro is widely or heavily advertised, it more than likely means that something much better is available elsewhere. If someone is radically trying to convert you to his microprocessor or his way of doing things, the chances are he has drifted into right field and become snookered into a bad scene. He is looking for converts to ease the pain when he is shot out of the saddle.

When anyone tries to tell you about micros, always ask, "What is the real reason you are telling me this?" Find out the motives involved. Then get a second opinion, check out another choice or find a different viewpoint before you plunge ahead.

Nail down all resources. It is easy to assume that formal courses and expensive, hardbound textbooks are the only way to "learn" microcomputers. In fact, these are two of the worst possible ways to become computer literate. Most of these learning aids are stillborn, hopelessly obsolete and misdirected.

Anything you can relate to that involves micros is a resource. Your first, and foremost, resource is yourself, through hands-on experience.

Other resources include micro magazines, clubs, game playing, Dungeons and Dragons sessions, micro trainers, computer stores, used wire-wrap boards, tech journals, funky books, reader-service cards, benchmarks, students, teachers, trade shows, surplus stores, computer fairs, rap sessions and swap meets.

And most important of all, go on your own vibes. There is no right or wrong direction in the micro world. In fact, 99.9 percent of the micro world remains unknown, unexplored and uncharted. So, if "they" insist on something, most often "they" don't know what they are talking about.

If you are interested in something and want to go in that direction, fine. Do it!

Your surest bet for long-term winning is to roll with your own vibes. Explore what you want to. Ignore the herd thundering the other way. Get off the beaten path.

Make yourself your own best customer. Satisfy your own needs and your own curiosity. Put as much psychic energy and personal value as you can in the routes that you pick, and you are certain to win the micro game.

You are, by definition, the center and the most important part of the micro universe.

Don't ever forget it. ■

Send SASE for free information

FORTH is an advanced language/system for advanced programmers. MMSFORTH is a professional version tailored to the Radio Shack TRS-80 Model I and professionally supported by Miller Microcomputing Services.

Interpreted, Compiler, Assembler, Full-Screen Editor, Structured & Modular Programming, Expandable Instruction Set w/Source Code

Graphics, Strings, Arrays, Double Precision, Very Fast and Compact, Virtual Memory

Includes 5 Demo Programs w/Source Code

MMSFORTH System Diskette (16K, 1 drive) \$64.95
MMSFORTH System Cassette (16K, Level II) \$44.95
MMSFORTH PRIMER (required for above) \$15.00
THE DATAHANDLER in MMSFORTH (32K, 1 drive) - an exceptionally fast, flexible and easy to use Data Base Management System \$49.95
P.L.M.S. Manual (required for DATAHANDLER) \$9.95
FLOATING POINT MATH and FULL Z80 ASSEMBLER \$29.95
Diskette (16K, 1 drive) \$25.00
Other FORTH literature - more detailed and advanced than \$19.95
USING FORTH PRIMER - very readable introduction \$6.95
FORTH TUTORIAL MANUAL - good on FORTH internal structure \$5.95
CALTECH FORTH MANUAL - good on FORTH internal structure \$5.95
Shipping is \$2 plus \$1 per extra book (Mass. orders add 5% tax, foreign plus 15%)

mmsFORTH
MILLER MICROCOMPUTING SERVICES
61 Lake Shore Rd., Natick, MA 01760
617 653 6136

✓ 235

COMPUTER FORMS ✓ 340

Distributor of Computer Paper Products

All paper products are white, blank, tractor feed, (pinfeed) fanfold continuous stock.

6" x 4" Postcard Stock (7" width with 1/2" margins) Use as is or trim for 3 1/2" x 5 1/2"

Pkg. 1000 cards . . . \$17.95 Pkg. 2000 . . . \$29.95
Box 4000 . . . \$49.95

Standard 9 1/2" x 11" Computer Paper (8 1/2" x 11" sheet)
Pkg. 500 sheets . . . \$5.95 Box 3500 sheets . . . \$27.95
Box shipping weight . . . 31 lbs.

Try our mini-paper! 6" x 8 1/2" sheet size (7" width includes 1/2" tractor margins)
Box 3200 sheets . . . \$23.95 sh. wt. only 17 lbs.

Cash Order: Include \$2 for shipping, excess will be billed with your order.
Credit card Order: Shipping will be added to your order. Include all credit card information.

Send for **FREE CATALOG** of paper products. Postcard stock, address labels, many sizes & types of paper.

Computer Forms. (616) 429-7922
5588 Caribou, Stevensville, MI 49127

CHECK OR MONEY ORDER

HERE'S THE SECOND HALF BY THE AUTHOR OF THE FIRST HALF.

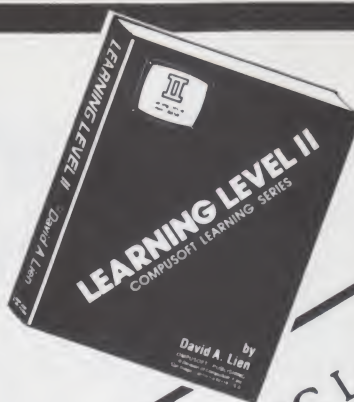
Learning Level II picks right up where the TRS-80* Level I manual left off, and is written in the same style that made the Level I manual a classic.

Learning Level II teaches you to use every Level II BASIC feature, including **PRINT USING**. You also learn to use the built-in **Editor**, a powerful tool for changing and correcting programs. A special section covers the many changes needed to **update the Level I Manual** for use with your Level II machine.

Learning Level II also shows you how to operate the the **Interface box**, **Dual Cassettes**, the **Realtime Clock**, **Printers** and other peripherals. All 23 error messages are explained in detail. The entire book is written so you can understand it. (And, it has an index.)

Your Level II TRS-80* simply isn't complete without **Learning Level II**.
Order your copy today!

COMPUSOFT™ PUBLISHING
A Division of
Compusoft, Inc.
San Diego, CA 92119



360 pgs.
Soft Cover
2nd Edition

Want to REALLY UNDERSTAND The BASIC Language?

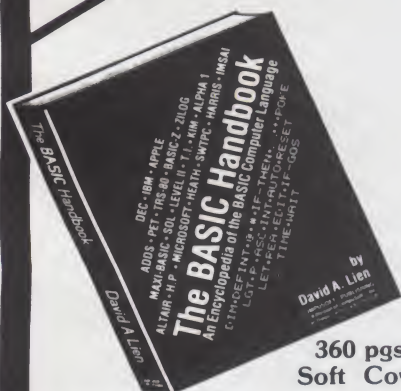
From the same author comes the book you've been asking for! **The BASIC Handbook** is the definitive reference and "idea" book, explaining in detail the BASIC language as used in over 100 favorite micros, minis, and mainframes.

A virtual **ENCYCLOPEDIA** of the BASIC language. In it is everything you need to know about the 250 most important BASIC statements, functions, operators and commands, explained in a way that you can put them right to work.

If there is an alternate way to write a program using other BASIC words, **the Handbook** shows you how. If there is a function needed but your machine doesn't have it, **the Handbook** shows you how to accomplish the same thing in other ways. **This HANDBOOK** is written to be used! With **The BASIC Handbook** you can finally make those programs found in magazines run on your computer!

* TRS-80 is a Radio Shack Trademark.

Pioneer Way, El Cajon, CA 92020
1050 EK
Telephone (714) 588-0996



360 pgs.
Soft Cover

Is TRS-80* Level II covered — YES!
Is PET covered — YES!
Is Apple covered — YES!
Sorcerer, Altair, Imsai, Etc.
YES ... and over 50 more!

CompuSoft Publishing — 1050 EK
Telephone (714) 588-0996

- ☐ Yes, I want to LEARN Level II. Please send _____ copies.
My U.S. check or money order for \$15.95 each + \$1.45 for postage (air mail - \$5.00) is enclosed.
- ☐ Yes, I need the BASIC Handbook. Please send _____ copies. My
U.S. check or money order for \$14.95 + \$1.35 for postage (air mail - \$5.00) is enclosed.

Name _____
Address _____
City, State, Zip _____

Dealers Inquiries Welcome

Improving the OSI Challenger C2

First in a two-part series on the inner workings of Ohio Scientific's "500" boards.

Ugo V. Ré
167 Sprucewood Drive
Levittown, NY 11756

OSI's C2 is a general-purpose system incorporating several unique features. In addition to the advertised features, there are other hardware features and prototype areas on many of the circuit boards that you can use to implement some specialized circuits.

While the documentation is sparse for the C2-4P, a thorough study of the 500 manual and the schematics for the various boards will reveal several features such as: dual system clock operation, a serial interface with multiple baud rate operation and modem control leads, two selectable video screen sizes, reverse video display and a parallel interface option.

This article describes the hardware features of the various boards and the modifications I made to these boards to implement the additional features. I used an older C2-4P system, which contained two power supplies (+5 V, 3.5 Amps and -9 V, 1.5 Amps), a four slot bus backplane, a model 500 CPU board, a model 540 video board and a model 542 polled keyboard in a typewriter-style case. In the newer systems the 500 CPU board has been replaced by a 502 CPU board, and there is only one power supply (+5 V, 4.5 Amps).

Model 500 CPU Board

This CPU board includes the following hardware features:

- A 6502A microprocessor operating at 1 MHz.
- A 6850 ACIA (asynchronous communications interface

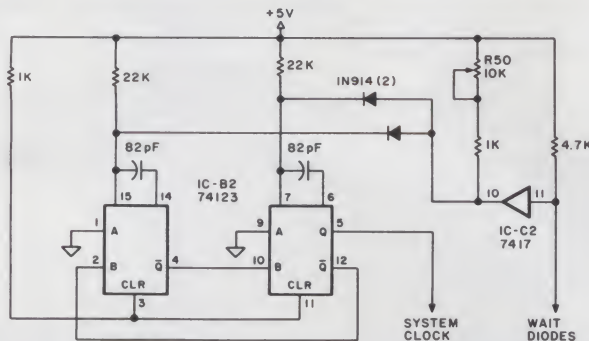


Fig. 1. CPU system clock circuit.

adapter)-based serial interface configured for both RS-232C and 20 mA loop current.

- 4K static RAM for user programs.
- Microsoft BASIC in 8K ROM.
- System monitor and I/O controllers in three 1702 EPROMs.
- Provisions for a user-provided 6820 PIA (peripheral interface adapter) parallel I/O port.

System Clock

The 6502 clock (see Fig. 1) is provided by a dual one-shot operating as a multivibrator. The clock circuit is populated as an adjustable two-speed clock that is normally set for a high speed of 1 MHz, but with the optional WAIT diodes, it will revert to a low-speed operation of approximately 500 kHz whenever the WAIT line is brought low.

With the components supplied by OSI, you can adjust the clock via R50 (see Fig. 2) for a high speed of 1.6 MHz without creating any problems. Since the frequency will have a tendency to change with temperature, all frequency adjustments should be made only after a long warm-up and with the case closed.

If the clock speed has been set too high or has drifted high, then the following problems, which are usually caused by the slow access time of the EPROMs and the ROMs, may occur:

- Screen does not display C/W/M? after reset.
- Monitor or I/O not operating correctly.
- Keyboard operation not recognized by computer in machine or BASIC mode.
- Programs stop running or will not run.

To correct the problem, lower the clock speed or install any of the WAIT diodes (D5, D6, D8, D10 or D11). See Fig. 3.

I have been operating the system at 1.58 MHz without any WAIT diodes and have not had a problem. However, I have noticed that programs execute faster and the cassette operation is flawless even when operated at 1200 baud.

ACIA Clock

The ACIA-based serial interface (Fig. 4) uses a 555

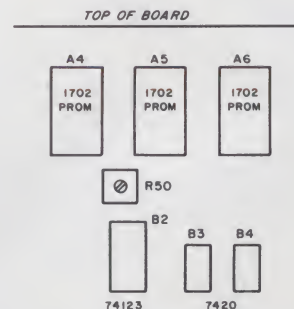


Fig. 2. System clock component location.

astable multivibrator to provide the baud rate clock. The clock circuit has provisions for five capacitors, which are jumper selected to provide a wide range of baud rates. Potentiometer R51 allows the frequency to be fine-tuned to 16 x the baud rate. However, this hard-wired method limits the interface to operation at only one baud rate.

There are two methods you can use to switch the frequency of the 555 multivibrator: change the C5 capacitor or change resistors R22 and/or R23. Of the two methods, I chose the former. Changing resistor values involves changing multiple combinations of R22 and R23 or using large values for R22. Additionally, the duty cycle of the square wave, which is directly affected by the ratio of the resistor values, becomes a spike whenever the R22-R23 ratio is too large.

I made the following modifications to provide switch-selectable baud rates:

- Calculate the capacitors required for the desired baud rates. Table 1 gives the formula to calculate the capacitor values. Table 1, column A, gives six capacitors for six possible baud rates.

- Install the six capacitors on a two-pole, six-position rotary switch (Radio Shack #275-1386). The capacitors in column A are not available as standard values. Therefore, I used standard values wired in series to obtain the required values (see Table 1, column B).

- Connect the first capacitor, .068 uF, between the first switch position and one terminal on the other half of the switch (see Fig. 5). The five remaining capacitors are wired in series from terminal to terminal starting at the first terminal.

- Remove the jumper between the J5 donut and the capacitor on the board (see Fig. 6).

- Install a shielded wire from the J5 donut to the rotary switch pole. The shield should be grounded at the board end with the other end soldered to the ground terminal on the rotary switch (see Fig. 5). I used a shielded wire to prevent stray signals from affecting the 555 circuit and frequency.

- After the wiring has been completed and checked, turn on the computer and allow it to warm up.

- To check and adjust the frequency, connect a frequency counter to L1 connector pin 7 (see Fig. 6), then reset the computer.

- Select the first switch position, 110 baud, and adjust the potentiometer, R51 (see Figs. 5 and 6), for a frequency of 1760 Hz.

- Select the other baud rates and check that they are within 0.1 percent of the required frequency (see Table 1, column C). Do not readjust R51.

Frequency Adjustment

If the frequency is higher than the required value, a low-value trimming capacitor can be added in parallel with the capacitor being tested to lower the frequency. If the frequency is lower than required, replace the capacitor with a capacitor of lower value and add trimming capacitors in parallel to obtain the required frequency.

With the capacitors wired in series, any change made to one capacitor will affect all others after it in the chain. When trimming capacitors to obtain the required frequency, always work on the lower frequency before adjusting the next higher frequency.

Using the above capacitor trimming procedure, it is possible to get the frequencies within $\pm .05$ percent (see Table 1, column D). Generally, I use only three baud rates — 110 for a Teletype and 300 and 1200 for the audio cassette and modem.

555 Frequency calculations

$$C(\mu F) = \frac{1}{.693 \cdot R \cdot f_{Hz}}$$

$$R = (R_{22} + 2(R_{23} + R_{51}))$$

(pot R₅₁ set at midpoint)

$$R = 12060$$

555 Frequency components

Rate	Baud calculated value (A)	Capacitor value in series (B)	frequency calculated value (C)	frequency measured value (D)
110	.068	.068	1760	1759
300	.025	.039	4800	4801
1200	.0062	.0082	19200	19194
2400	.0031	.006	38400	38379
4800	.0015	.003	76800	76869
9600	.0008	.002	153600	153785

Table 1.

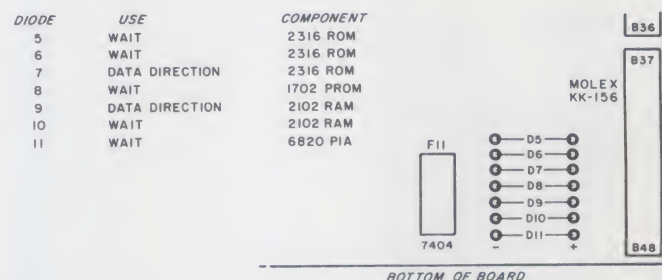


Fig. 3. WAIT diode location.

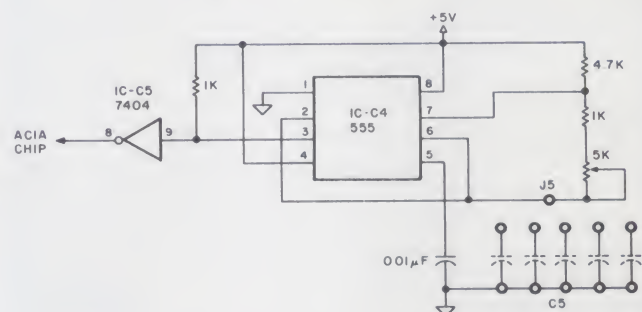


Fig. 4. ACIA clock circuit.

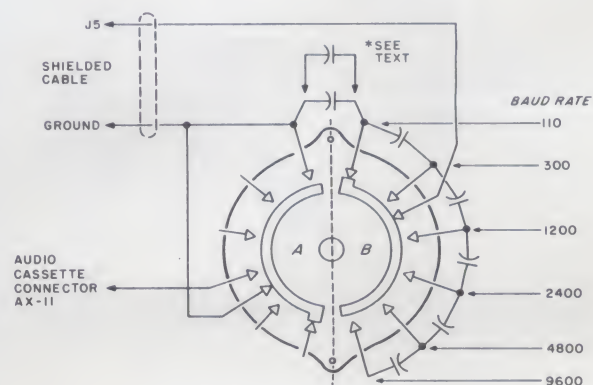


Fig. 5. Baud rate selector switch.

MULLEN Computer Products

H8 PROTOTYPE BOARD

Now available for the Heathkit H8 hobbyist.

- Full-sized FR-4 board with heat sink/mounting brackets, buss connectors and polarizing key
- Designed for ease of external cable connection
- All plated thru holes .042" on .1" centers, power and ground traces

HKB-1 H8 PROTOTYPE BOARD \$46. Kit



H8 EXTENDER BOARD

Our HTB-0 lets H8 owners troubleshoot their boards faster and easier. Each board can be extended above the computer for complete access to all circuits and components.

FEATURES

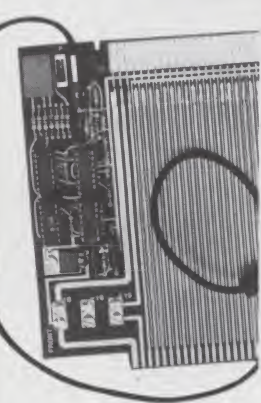
- Sturdy 3/32" board
- Molex 25-pin edge connectors with formed leads for easy scope probe attachment
- Jumper links in power lines makes current measurement and fusing easy

HTB-0 H8 EXTENDER \$39. (Kit only)

Up-Date

MULLEN Computer Products

S-100 EXTENDER/LOGIC PROBE



- New interlaced ground and signal traces, improves performance, reduces noise, with the new high clock frequency boards
- New brighter display, makes this very handy logic probe easier to use
- New proposed IEEE buss edge connector label, with all the fine quality documentation you expect with Mullen kits.
- High quality FR-4 board is double sided with plated thru holes and solder-masked for easy kit assembly
- Gold on all mating connector surfaces for better electrical contact
- Formed connector leads for easy scope probe attachment
- Jumper links in power lines makes current measurement and fusing easy
- Large "kluge" area lets you build and test your own circuits

S-100 EXTENDER/LOGIC PROBE \$59. Kit \$79. Assem/tested

S-100 CONTROLLER BOARD

8 relay - OUTPUTS

8 opto-isolator - INPUTS

256 switch selectable addresses

Our S-100 CONTROLLER is used in laboratories, at universities, and in industry, in hundreds of applications, and may be the answer to your control problem. Complete programming and operating instructions included.

For higher power applications a 500W AC POWER MODULE is available for \$15.

CB-1 CONTROLLER Kit \$129. Assem/tested \$179.

MULLEN Computer Products

NEW TRS-80* CONTROL BOX

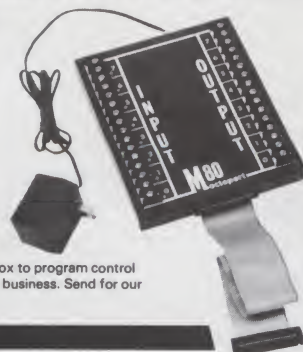
ASSEMBLED BURNED-IN & TESTED, READY TO USE

Special introductory price
M-80 OCTOPORT
\$159. Assem/Tested

- 8 reed relay - OUTPUTS
- 8 opto-isolated - INPUTS
- Selectable port address
- Power supply
- Assembled cable & connectors

Use your TRS-80, and our M-80 control box to program control energy savings devices at home or in your business. Send for our free application notes today.

*TRS-80 is a trademark of Tandy Radio Shack Corp.



PLEASE ORDER KITS BY NAME (H8 OR S-100). SEND TO:
MULLEN COMPUTER PRODUCTS, BOX 6214, HAYWARD, CA 94544
OR PHONE (415) 783-2866. VISA/MASTERCARD ACCEPTED.
INCLUDE \$1.50 FOR SHIPPING & HANDLING. CALIFORNIA RESIDENTS ADD TAX.

Order Direct or Contact your Local Computer Store.

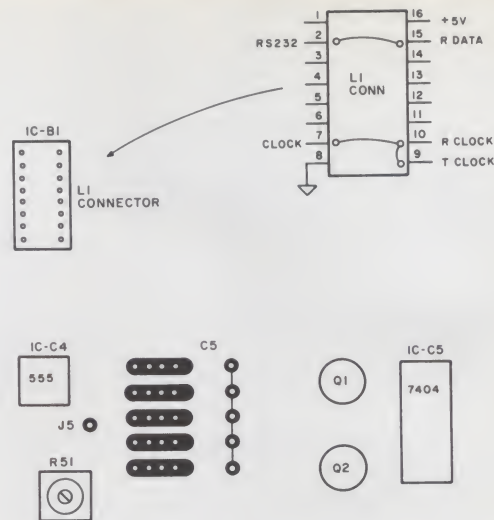


Fig. 6. ACIA clock component location.

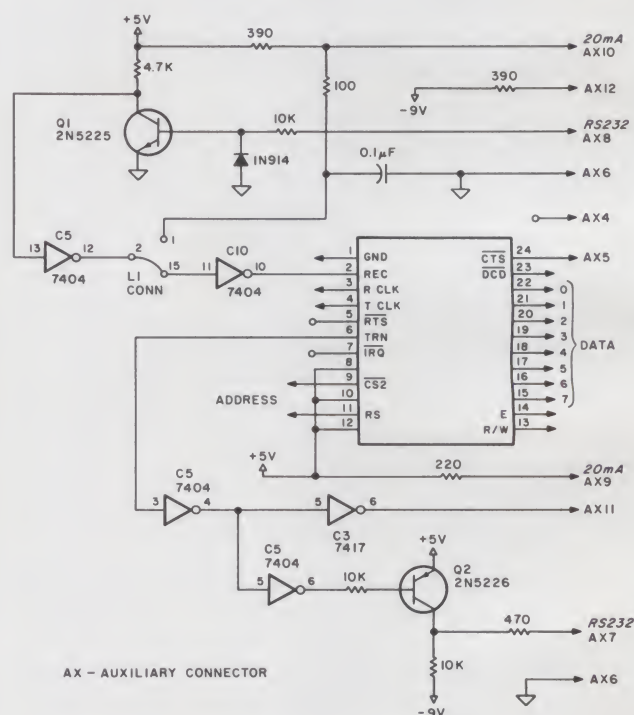


Fig. 7. Serial interface circuit.

For 300/1200 baud operation only, install a .0068 uF capacitor on the board and adjust R51 for a frequency of 19,200 Hz. Under software control, set the bits in the 6850 control register (see serial interface section) to select the + 16 (1200 baud) or + 64 (300 baud) clock rate.

Serial Interface

The 500 board (see Fig. 7) is provided with a 6850 ACIA chip and the components for both a 20 mA current loop and an RS-232C interface output circuit, simultaneously connected, and a 20 mA or RS-232C input circuit. Only one input circuit can be connected at a time.

The 6850 is a 24-pin DIP that interfaces the CPU to outside devices by converting parallel I/O to serial I/O. Either a byte of parallel data or a control code is transmitted by the CPU to

Watch the **SUN**TM rise over the Horizon!



The new price / performance
leader in S-100 computers

Complete System **\$4245⁰⁰**

Includes: Sun 1 Computer, terminal and desk
Plus fully integrated accounting system,
General Ledger, Accounts Payable & Receivable.

Optional 9 Mb hard disk system - **\$2975⁰⁰**

Sun 1 Computer

64K-Bytes RAM
656K-Bytes storage
Dual Micropolis Drives
CP/M* 2.2 & C-BASIC2
Serial and Parallel
printer ports

Video Terminal Port
Powerful 4Mhz Z80A CPU
Real Time Clock/system
time and date
2 week delivery A.R.O.



P.O. Box 61775 • Sunnyvale, CA 94088 • (408) 737-1606

*CP / M TM of Digital Research

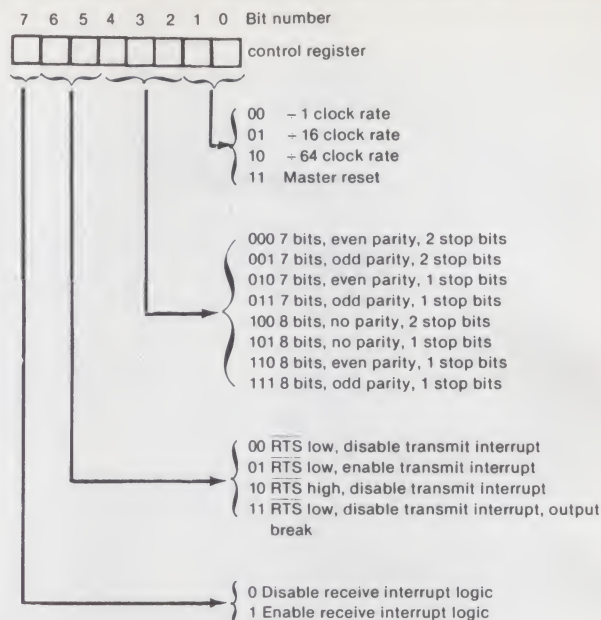
*Sun TM of Intelligent Business Machines

the 6850, while data or status is received by the CPU. In addition to the data bus and the transmit and receive clock and data leads, the 6850 has other control leads: the modem control leads CTS, RTS and DCD; the RS (register select) lead, which determines which of two addressable locations will be accessed; and the R/W lead, which determines whether a read or write operation is in progress. (The two addressable locations are the control/status address (FC00 hex) and the data address (FC01 hex)).

The control register is used to control the operation of the 6850. A code, which establishes the parameters for the 6850's operation (see Table 2), is written into the control register by the CPU. When the computer is reset, the CPU first loads the register with 03 hex (reset) and then B1 hex (+ 16 clock rate, eight bits, no parity, two stop bits). If this operation does not meet your needs, reset the control register and load in a new code (see Table 2).

The status register uses status flags to monitor the serial data transfer logic (see Table 3). The status register is read into the CPU's accumulator, then bit 0 or 1 is shifted right into the carry register. The carry register is then checked for the status of the receive data register or the transmit data register. If the register is set, the CPU will proceed to read or write data to the 6850 (see Table 3).

A program to read or write data to the 6850 is listed in Table 4. The other bits in the status register are used by the 6850 to determine the status of external devices, bits 2 and 3; to detect receiving errors, bits 4, 5 and 6; and to determine the source of an unacknowledged interrupt request, bit 7. The computer does not check the status of bits 2 through 7, and, in most cases, we do not need to check them for status during normal operation.



Program to change the control register.

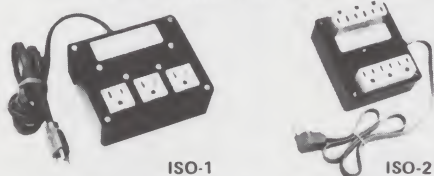
```
A9: 03      LDA    Master reset code
8D: 00: FC  STA    Write code to register
A9: XX*     LDA    New parameters
8D: 00: FC  STA    Write new parameters to control register
```

*Note: Select new parameters from list above. Byte is then converted to hexadecimal notation and entered in program.

Example: + 16 clock rate; 7 bits, even parity, 2 stop bits; RTS low, enable transmit interrupt; Enable receive interrupt logic 10100001 binary = A1 hex.

Table 2.

DISK DRIVE WOES? PRINTER INTERACTION? MEMORY LOSS? ERRATIC OPERATION? DON'T BLAME THE SOFTWARE!



Power Line Spikes, Surges & Hash could be the culprit! Floppies, printers, memory & processor often interact! Our unique ISOLATORS eliminate equipment interaction AND curb damaging Power Line Spikes, Surges and Hash.

***ISOLATOR (ISO-1A) 3 filter isolated 3-prong sockets; integral Surge/Spike Suppression; 1875 W Maximum load, 1 KW load any socket \$56.95**

***ISOLATOR (ISO-2) 2 filter isolated 3-prong socket banks; (6 sockets total); integral Spike/Surge Suppression; 1875 W Max load, 1 KW either bank \$56.95**

***SUPER ISOLATOR (ISO-3), similar to ISO-1A except double filtering & Suppression \$85.95**

***ISOLATOR (ISO-4), similar to ISO-1A except unit has 6 individually filtered sockets . . . \$96.95**

***ISOLATOR (ISO-5), similar to ISO-2 except unit has 3 socket banks, 9 sockets total . . \$79.95**

***CIRCUIT BREAKER, any model (add-CB) Add \$7.00**

***CKT BRKR/SWTCH/PILOT any model (-CBS) Add \$14.00**

PHONE ORDERS 1-617-655-1532

ESP Electronic Specialists, Inc.

171 South Main Street, Natick, Mass. 01760

Dept.KB

The serial I/O ports of the 6850 are wired to the components that comprise the 20 mA and RS-232C circuits. (The 20 mA current loops interface is specifically for use with the ASR-33 Teletype. It has no common ground and cannot be used with terminals requiring a common ground on output.) The 500 board has a serial interface auxiliary connector mounted near the 6850 chip (see Fig. 8), which uses pins 5 through 12 for the RS-232 and 20 mA data leads and a CTS (clear to send) control lead.

The 6850 uses a low CTS to set the status register and report a TDRE (transmit data register empty) condition. The computer determines when to transmit a byte of data to the 6850 by testing the register for the TDRE condition. A high

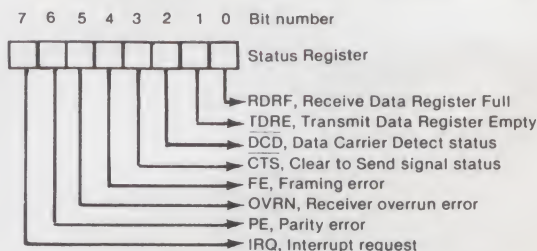


Table 3.

AD, 00, FC	LDA	load status register
4A	LSR	shift bit '0' to carry
90, FA	BCC	not ready, check again
AD, 01, FC	LDA	load receive data
9D, XX, XX	STA	store data in memory

Table 4a. Serial data operation. Receive data from the serial port. This program will continue until all data is received. It should check for end of data character, and the index register must be incremented to access the next memory address.

AD, 00, FC	LDA	load status register
4A	LSR	
4A	LSR	shift bit '1' to carry
90, F9	BCC	not ready, check again
BD, XX, XX	LDA	load Acc from memory
8D, 01, FC	STA	store data in ACIA

Table 4b. Transmit data from memory to serial port. This program will continue until all data has been transmitted. It must increment the index register to access the next memory address. It must also check for the last data address.

$\overline{\text{CTS}}$ signal will prevent the register from reporting a TDRE condition.

The $\overline{\text{CTS}}$ is normally strapped to ground; however, the lead can be used as an interrupt signal for loss of transmission facilities, low paper alarm, printer or cassette not on line, etc., to prevent the needless transmission of data into an open line.

To modify the $\overline{\text{CTS}}$ lead, remove the strap between pin 24 and ground and install a 1k resistor from pin 5, auxiliary connector to +5 V. The $\overline{\text{CTS}}$ lead, which will be high, can now be used to determine the status of the receiving device. Do not make this modification unless you can control the $\overline{\text{CTS}}$ lead, since the computer will go in a loop on SAVE, where it will remain until $\overline{\text{CTS}}$ is brought low.

The 6850 also has an RTS (request to send) control lead used to inform a data set that it is ready to transmit data. The data set will return the $\overline{\text{RTS}}$ signal as a $\overline{\text{CTS}}$ signal when it establishes a data link. The 6850 outputs a low $\overline{\text{RTS}}$; therefore, $\overline{\text{CTS}}$ will be low and the computer will proceed to output the data. The $\overline{\text{RTS}}$ terminal, pin 5 of the 6850, is not used; however, it can be wired to the spare pin 4 of the auxiliary connector.

The only remaining work is to install an EIA connector (DB255) in the cutout at the rear of the case and wire it to a Molex plug (KK-156 cut to provide one 3-pin and one 9-pin plug) following the pin-out in Table 5. Now you can use the EIA connector to connect to a printer or data set. The 20 mA leads are wired to the connector only for convenience and

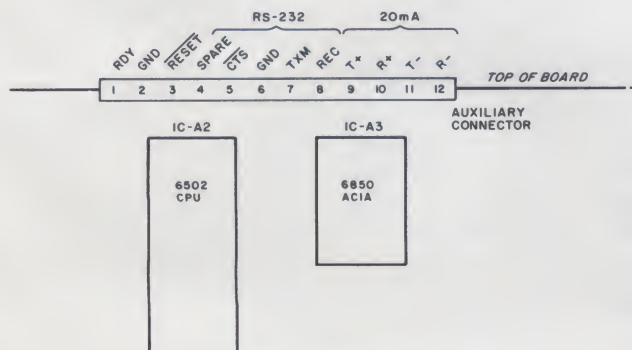


Fig. 8. Serial interface connector.

Master Accountant

Accounts Receivable

Designed as a complete invoicing and monthly statement generating system which keeps track of current and aged accounts receivable, open item or balance forward, prints statements and invoices, automatic interface with the general ledger (if present), automatic month-end file backup, and recovery routines for hardware failure.

A/R w/manual \$100.00
Manual \$25.00
Demo system w/manual \$50.00

Accounts Payable

Keeps track of current and aged accounts payable. Maintains a complete record for each vendor, helps determine which vouchers to pay by due date or discount date or within certain cash requirements. Designed to interface with the general ledger (if present) to provide automatic monthly journal entries.

A/R w/manual \$100.00
Manual \$25.00
Demo system w/manual \$50.00

Payroll

Allows a company to prepare its periodic payroll for hourly, salaried, and commissioned employees while accumulating the necessary information for tax reporting. It generates the monthly quarterly, and annual returns to be filled with local, state, and federal governments. Will interface with the general ledger (if present).

Payroll w/manual \$100.00
Manual \$25.00
Demo system w/manual \$50.00

General Ledger

Designed to record your financial transactions and balances of those transactions, provide accurate and timely statements (balance sheet and income statement), and provide you with comparative data on your financial position one year ago at this time. Automatically interfaces with A/R, A/P, and PR (if present).

General Ledger w/manual \$100.00
Manual \$25.00
Demo system w/manual \$50.00

Requires CP-M - Microsoft Basic - 48K Ram - Dual Discs. Available on 8 inch soft Sector Diskettes only.

Computer
Services

30 Hwy. 321, N.W.
P. O. Box 2292
Hickory, N. C. 28601
(704) 294-1616

✓ 80

Payment: Cash, M.O., M-C, and Visa.
Checks require 3 weeks to clear bank.

Shipment: UPS or 1st class mail,
Please include \$2.50 shipping plus
\$1.50 if COD. Phone hours 6pm to
9pm EST.

APPLE — JACK

the graphics & games people

New!

Super Starbase Gunner

\$19.95
DISK



\$19.95
DISK

✓ 314

Most shoot-em-up target games are 2-D shoot across the screen type, and quite frankly there is a glut of inferior ones. A need for a new approach exists, such as fast 3-D HIRE simulations with clever and complex challenges. How about shooting into the screen, into 3-D space, where the target is mathematically many feet behind the screen surface? How about computer intelligent targets that shoot back and use strategy and learn? How about all this and the best attributes of the more popular games? Let's include high score, 10 levels of play, snappy sound effects, colorful explosions and real time graphics. Why not go all the way and have a three dimensional gunsight? A real space battle simulation... Nah... no one would believe it or could even write it. Right?

WRONG!! WE HAVE IT... and it is SUPER STARBASE GUNNER. We are very excited about this product because it is all the things we wish we had and didn't. And you can have it now with this introductory offer.

SUPER STARBASE GUNNER DISK...\$19.95 48K with APPLESOFT ROM

AVAILABLE FROM YOUR DEALER OR DIRECT FROM
APPLE — JACK, BOX 51, CHERRY VALLEY, MA 01611
(INQUIRIES INVITED)

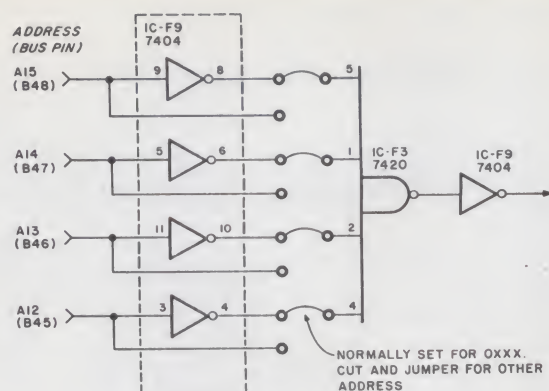


Fig. 9. 2102 RAM address decoding.

EIA Pin-out		Auxiliary Connector
1	Ground	--
2	Input to CPU	8
3	Output to CPU	7
4	Request to send	4
5	Clear to send	5
7	Signal ground	6
12	20 mA input (+)	10
13	20 mA output (+)	9
24	20 mA input (-)	12
25	20 mA output (-)	11

Note: Auxiliary connector pins 1, 2 and 3 are wired to the 6502 CPU control pins, RDY and RES.

Table 5. EIA connections.

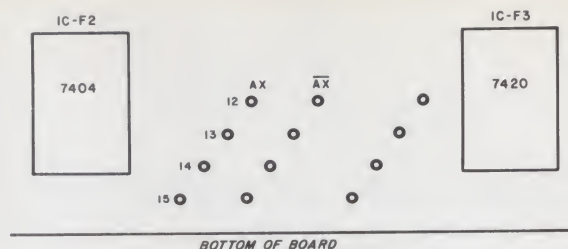


Fig. 10. Address jumpers for 2102 RAM.

are not part of the RS-232C standard.

RAM Addressing

The 2102 RAM on the 500 board is decoded for a 4K block starting at hex 0000 (page zero) (see Fig. 9). Additional memory boards, model 420 or model 527, can be added to a spare slot on the motherboard. The addition of a 420 board will not cause a problem, since the board can be decoded to occupy the next unused 4K block of memory. The addition of the 527 board, however, will create a problem, since it can only be changed to occupy an 8K block. Therefore, when installing a 527 board, you should decode it for page zero and decode the 2102 RAM for some other location. The foil trace from the $\overline{A}x$ donut to the right-most donut (see Fig. 10) must be cut and a new jumper installed to the Ax donut.

I installed a 527 board with 16K of memory and moved the 2102 memory to location C000 hex. This memory is now used for machine-language programs. BASIC, which normally uses all consecutive memory, cannot normally access this memory; therefore, there is little danger of destroying any programs stored at that location.

ROMs and EPROMs

No changes were made to these areas, but other ROMs, PROMs or EPROMs containing a more versatile language or monitor can be substituted for the ROMs and EPROMs presently on the board. The 500 CPU manual lists other ROMs that can be used with only minor strapping changes.

Peripheral Interface

The 6820 PIA interfaces with the CPU to provide two parallel I/O ports. Although I have not implemented the parallel port fully, I have added the following components to the board (see Fig. 11):

- A 40-pin IC socket at location A1.
- J1 and J2 jumper located at the bottom and right side of socket.
- Two Molex connectors along left edge of board.

All that remains is to install the 6820 chip in the socket and then develop devices that will work with the parallel port, joystick, X-Y plotter or AC control. The newer 6522 VIA (versatile interface adapter) may be a better chip than the 6820; however, I have not investigated the modifications required.

We will continue with our discussion of hardware modifications to OSI's circuit boards next time. ■

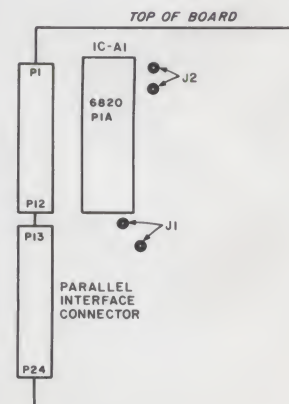


Fig. 11. PIA component location.

ATTENTION SOFTWARE AUTHORS

From The Company That Brought You Adventure, by Scott Adams

We are now accepting TRS-80, Apple, and Atari software for review to manufacture under the Adventure International label. Join the fastest growing software company in the U.S. and enjoy a money paying hobby as well. Just send a machine readable copy of your program with documentation to: Adventure International, Box 3435, Longwood, Florida 32730



THE NEXT GENERATION OF MICROCOMPUTERS IS HERE AT QUASAR DATA PRODUCTS



16 BIT POWER Z-8000

AND STILL RUN YOUR 8 BIT SOFTWARE



IF YOU SEE IT OUR WAY THEN WE THINK WE HAVE THE PRODUCTS FOR YOU:

- THE S-100 BUS IS HERE TO STAY. IT IS NOT THE GREATEST BUT WITH PROPER TERMINATION IT WORKS RELIABLY AT HIGH SPEEDS. AND SINCE IT IS NOW AN IEEE STANDARD, IT IS WELL DEFINED.
- THE 8 BIT SYSTEMS ARE USEFUL BUT THEY ARE THE LIMITING FACTOR FOR MANY APPLICATIONS.
- THE 16 BIT SYSTEMS ARE THE WAY FUTURE SYSTEMS WILL GO. WHY NOT? THERE IS VERY LITTLE PRICE DIFFERENCE AND AN ORDER OF MAGNITUDE PERFORMANCE DIFFERENCE.
- THE REAL USEFULNESS OF THE 16 BIT MICROPROCESSORS WILL BE DETERMINED BY THE SOFTWARE.
- THE SYSTEMS USING 5 1/4 INCH DISK DRIVES REALLY DO NOT HAVE ADEQUATE MEMORY STORAGE OR COMPUTER POWER FOR MANY BUSINESS OR SCIENTIFIC APPLICATIONS.
- SIXTY-FOUR KILOBYTES OF ADDRESSABLE RAM, THE MAXIMUM FOR 8 BIT SYSTEMS, IS NOT ADEQUATE FOR MANY BUSINESS OR SCIENTIFIC APPLICATIONS.
- IT IS NOT WORTH BUYING 8 BIT SYSTEMS OR BOARDS NOW IF YOU CAN GET THE SAME SOFTWARE WITH 16 BIT SYSTEMS AT ABOUT THE SAME PRICE.

Z-8000 SERIES 16 BIT CPU S-100 BOARD — CAN BE PLUGGED INTO YOUR EXISTING SYSTEM \$695.00

- FULLY S-100 IEEE COMPATIBLE
- SUPPORTS EXISTING 8 BIT MEMORY AND 8 BIT PERIPHERAL BOARDS
- CAPABLE OF READING AND/OR WRITING 8 BIT, 16 BIT OR MIXED 8 BIT AND 16 BIT MEMORIES AUTOMATICALLY
- 8 BIT AND/OR 16 BIT PERIPHERAL MODULES CAN SIMULTANEOUSLY CO-EXIST IN THE SAME BUS WITHOUT ANY MODIFICATIONS
- CAPABLE OF OPERATING AS A SLAVE PROCESSOR TO ENABLE YOUR EXISTING CPU TO CONTROL THE Z-8000

**INDUSTRIAL
QUALITY**

QDP-8100 WITH 2 MEGABYTES STORAGE STANDARD (OPTIONAL 4 MEGABYTES)

- Z-8000 SERIES 16 BIT CPU S-100 BOARD - SEE ABOVE
- SOFTWARE (PROVIDED WITH SYSTEM)
 - CP/M 2.2¹ OPERATING SYSTEM
 - BASIC
 - Z80/8080 EMULATOR
 - MONITOR, DEBUGGER, DISASSEMBLER
 - SOFTWARE OPTIONS: PASCAL
 - UNIX² OPERATING SYSTEM COMING

\$6,395.

SYSTEMS

- THE NEW 16 BIT MICROPROCESSORS HAVE POWER COMPARABLE TO MINICOMPUTERS BUT DO NOT REQUIRE THE SAME OVERHEAD IN TERMS OF DOWNTIME, MAINTENANCE, OR INITIAL INVESTMENT. THEY ARE MORE VERSATILE IN MANY APPLICATIONS SUCH AS REAL TIME APPLICATIONS.

THIS IS WHAT QDP HAS AVAILABLE:

- A Z-8000 BOARD THAT CAN PLUG INTO YOUR EXISTING S-100 BUS SYSTEM (SEE BELOW FOR DESCRIPTION)
- A COMPLETE Z-8000 SYSTEM (SEE BELOW FOR DESCRIPTION)
- A Z-8000 SYSTEM CONFIGURED FOR YOUR EXACT NEEDS.
- SOFTWARE TO ALLOW YOU TO RUN ALL THE AVAILABLE Z-80/8080 SOFTWARE INCLUDING CP/M
- SOFTWARE THAT INCLUDES A MONITOR, DEBUGGER, DISASSEMBLER, AND BASIC
- SOFTWARE OPTIONS A) EXTENDED MONITOR B) PASCAL C) SIMULATORS FOR 8080, Z-80, 6802, 6502, 1802
- A Z-80 SYSTEM (QDP-100) THAT IS UPWARD COMPATIBLE WITH THE Z-8000

THIS IS WHAT IS COMING FROM QDP:

- A 256 KILOBYTE RAM CARD.
- UNIX² OPERATING SYSTEM.
- SUPPORTS ON-BOARD HARDWARE SINGLE STEPPING
- SUPPORTS EITHER SEGMENTED CPU OR NON-SEGMENTED CPU
- POWER-ON AND RESET JUMP DIP SWITCH SELECTABLE
- JUMPER SELECTABLE 2 OR 4 MHz. OPERATION
- DIP SWITCH SELECTABLE NUMBER AND TYPE OF WAIT STATES
- SOFTWARE
 - Z-80 EMULATOR ENABLES YOU TO EXECUTE YOUR EXISTING 8 BIT SOFTWARE WITHOUT ANY MODIFICATIONS AND ALLOWS YOU TO RUN CP/M IMMEDIATELY
 - EXTENDED MONITOR, DEBUGGER, DISASSEMBLER

QDP-100 WITH 2 MEGABYTES STORAGE STANDARD (OPTIONAL 4 MEGABYTES)

- Z-80 SERIES 8 BIT CPU S-100 BOARD (4 MHz Z-80, DBL DENSITY DISK CONTROLLER, 2716 PROM BURNER 2 PARALLEL & 2 SERIAL PORTS, REALTIME CLOCK)
- SOFTWARE (PROVIDED WITH SYSTEM)
 - CP/M 2.2¹ OPERATING SYSTEM
 - BASIC
 - ACCOUNTS RECEIVABLE, GENERAL LEDGER, ACCOUNTS PAYABLE, PAYROLL WITH COST ACCOUNTING
 - OPTIONAL SOFTWARE: FORTRAN, PASCAL, COBOL, C

\$4,995.

EACH SYSTEM CONTAINS:

- INTELLIGENT CRT TERMINAL (80 CHARACTERS X 24 LINES)
- 64 KBYTES RAM
- TWO 8 INCH, DOUBLE SIDED, DOUBLE DENSITY FLOPPY DISK DRIVES WITH CONTROLLER
- 2 SERIAL AND 1 PARALLEL (2 PARALLEL FOR QDP-100) PORTS
- ATTRACTIVE WOODGRAIN CABINET WITH POWER SUPPLIES AND CABLING

¹CP/M™ DIGITAL RESEARCH

²UNIX™ BELL LABS

FULL TECHNICAL SUPPORT FROM THE STAFF AT QUASAR DATA PRODUCTS

4 Mhz 64K Dynamic RAM

16K - '\$250' 32K - '\$350' 48K - '\$450' 64K - '\$549'

QUASAR FLOPPY SYSTEM

- Two MFE DBL sided drives • Cable • Case & Power Supply assembled and tested Wood cabinet '\$1895'



QUASAR 2 MEG FLOPPY

- 2 MFE double sided drives
- Teletex disk controller board
- Power supply & cable
- Wood cabinet
- CP/M version 2.2 & bios
- Assembled & tested '\$2295'

Dealer Inquiries Invited, Hours: 9:5:30 M-F

Specifications Subject To Change



PAPER TIGER

Includes Graphics '\$949'

Cable for TRS-80 '\$39'

Call for Apple

TELETEK DBL. DENSITY, DBL. SIDED

Disk Controller Board. '\$395'

MFE Double Sided - Double Density

8" Floppy Disk Drives. (the best) '\$650'
Using the Teletex Controller under CP/M,
THIS DRIVE WILL GIVE YOU ALMOST
ONE MEGABYTE PER DISK DRIVE.
Power supply for above '\$110'

TI - 820

Serial Printer -

Full package options... '\$1995'

Unix™ - Bell Lab

30 Day ARO

CP/MTM - Digital Research

Checks, money orders accepted

Add \$2.50 freight charges on orders under 10 lbs. Over 10 lbs. F.O.B. Cleveland



QUASAR DATA PRODUCTS

✓ 295



25151 Mitchell Dr., No. Olmsted, Ohio 44070 (216) 779-9387

Back-Space Mod for CP/M and Microsoft BASIC

An annoying characteristic of the system prompted this article.

Rod Hallen
State Dept.-Accra
Washington, DC 20520

I have used Digital Research's CP/M disk operating system and Microsoft disk BASIC for about two years, and I still think the combination is great. However, one feature of both of them annoys me: the way character deletions are handled.

If you type a CP/M command line and inadvertently hit the wrong key, you can delete that character from the command line buffer by pressing the Delete key. If you continue to press the Delete key you will delete another character from the buffer for each depression. That's fine. What bothers me is the screen presentation. Instead of the cursor backing up and erasing the undesired characters, they are repeated on the screen. You type DIX by mistake, delete to get rid of the X and you have DIXX. Add the proper R and you have DIXXR. CP/M understands that this means DIR, but there has to be a better way. This is especially confusing when you have to make multiple corrections within a line.

A worse situation exists in Microsoft disk BASIC. The first time you hit Delete, a backslash

is printed, then the undesired character. If you continue to hit Delete, the previous characters are printed one by one. When you hit anything other than Delete, another backslash is printed, and then you can go on with the line. I assume the reason for both methods is that they were originally designed for a hard-copy terminal, which can't back up and erase.

The Better Way

I finally decided to rewrite CP/M so that the cursor would back up and erase, instead of echo, anything I wanted to eliminate. Unfortunately, all this echoing and backslashing takes place deep within CP/M and Microsoft, and I don't have a source listing for either. I do have a source listing for my CBIOS (Custom Basic Input/Output System), which is almost as good.

I fooled CP/M by filtering the output to get rid of the echos and backslashes. At the same time, I wanted to use the Back Space key instead of the Delete key for corrections because Delete is an uppercase function on my keyboard and Back Space is not. It was simpler than I thought; now I wish I had done it a year ago.

Listing 1 is a portion of my CBIOS. Your BIOS should be similar, but it will not be exactly the same since each microcomputer implementation is different. That is why it is called a "custom" BIOS. I use a Cromemco Z-2 with an Imsai VIO video

interface board and a Percom C1812 for interfacing to my Spinwriter ICSR.

CBIOS Operation

Note the CONIN routine. This keeps checking the keyboard status port to see if bit 6 is a 1. If it is, a character is waiting; if not, CONIN checks again. When a character is ready it is brought to the accumulator and bit

seven is cleared. Next, check for a Back Space (hex 8) and, if you don't find one, return to CP/M with the keyboard character in the A register. If you find a Back Space, set the Delete flag for later use, then load 7FH, the ASCII Delete code, into the A register and return to CP/M.

You've hit a Back Space, the DELETE FLAG is set and the Delete code is sent because

```

CEB9 DB08      CONIN  IN      KSPORT  ;GET KEYBOARD STATUS
CEBB E601      ANI      40H      ;IS CHAR READY?
CEBD C2B9CE    JNZ      CONIN    ;IF NOT TRY AGAIN
CEC0 DB09      IN      KSPORT  ;GET CHARACTER
CEC2 E67F      ANI      7FH      ;MASK BIT 7
CEC4 FE08      CPI      8        ;IS IT A BACKSPACE ?
CEC6 C0        RNZ          ;IF NOT RETURN
CEC7 3E01      MVI      A,1      ;SET
CEC9 3206CF    STA      DELF     ;DELETE FLAG
CECB 3E7F      MVI      A,7FH    ;LOAD DELETE
CECE C9        RET

CECF C5        CONOUT  PUSH     B      ;SAVE REG
CED0 3A06CF    LDA      DELF     ;GET DELETE FLAG
CED3 FE01      CPI      1        ;IS IT SET ?
CED5 CAE7CE    JZ       CON1     ;IF SO, HANDLE
CED8 3A07CF    LDA      MICROS   ;GET MICROSOFT FLAG
CEDB FE01      CPI      1        ;IS IT SET?
CEDD C2FCCE    JNZ      OUTZ     ;IF NOT SKIP
CEE0 AF        XRA          ;RESET
CEE1 3207CF    STA      MICROS   ;MICROSOFT FLAG
CEE4 C304CF    JMP      OUT1     ;EXIT

CEE7 79        CON1   MOV      A,C  ;GET CHARACTER
CEE8 FE5C      CPI      5CH      ;IS IT A BACKSLASH ?
CEEA C2F5CE    JNZ      CON2     ;IF NOT, SKIP
CEED 3E01      MVI      A,1      ;SET
CEEF 3207CF    STA      MICROS   ;MICROSOFT FLAG
CEF2 C304CF    JMP      OUT1     ;EXIT

CEF5 3E08      CON2   MVI      A,8  ;LOAD BACK SPACE
CEF7 CD03F8    CALL     C,7FH    ;AND SEND IT TO VIO
CEFA 0E7F      MVI          ;LOAD DELETE

CEFC 79        OUTZ   MOV      A,C  ;GET CHARACTER
CEFD CD03F8    CALL     0F803H   ;SEND IT TO VIO
CF00 AF        XRA          ;RESET
CF01 3206CF    STA      DELF     ;DELETE FLAG
CF04 C1        OUT1   POP      B    ;RESTORE REG
CF05 C9        RET

CF06 00        DELF   DB      0      ;DELETE FLAG
CF07 00        MICROS DB      0      ;MICROSOFT BASIC FLAG
    
```

Listing 1. The portion of my CBIOS that handles keyboard input and screen output. This has been modified to eliminate Delete and Back Space echos and to implement a true Back Space.

CP/M doesn't know what to do with a Back Space. At this point, CP/M deletes the last character from the Command line buffer and echos it to the screen. Intercept that echo before it gets to the screen output routine, then back up and erase the last character instead.

CONOUT is my video output routine. Enter it with the desired character in the C register and immediately save it. Then get the DELETE FLAG and check to see if it is set. If neither it nor the MICROS FLAG is set, a normal character must be coming through, and you can jump directly to the screen output routine (OUTZ).

If the DELETE FLAG is set, ignore any output from CP/M and

erase the last character on the current screen line. If the output character is a backslash, you're dealing with a Microsoft BASIC Delete. In this case, set the MICROS FLAG and exit without sending the backslash to the screen.

If the character isn't a backslash, it must be an echo, so ignore it. Instead, send a Back Space to the screen to back up the cursor and a Delete to eliminate the character the cursor now sits on. This is where you and I might be in conflict. Your video interface may need some other code or codes in order to back up the cursor and erase the last character. The Delete by itself might be sufficient. In any case, consult the manual for your video interface board or terminal to find out how this should be handled.

As long as you hit the Back Space key the cursor continues to back up, erasing characters as it goes. After each Delete is sent to the screen the DELETE FLAG is reset. As this routine is now written, the Delete key will still work the same way it did before, echo and all. If you want to use the Delete key instead of the Back Space key for corrections, then change the CPI 8 in line 6 of Listing 1 to CPI 7FH.

OK, but what about the second backslash in a Microsoft correction? You've already ignored the first backslash and set the MICROS FLAG. The following echoed characters will be ignored and the undesired ones erased in the same manner as with a CP/M correction. When the trailing

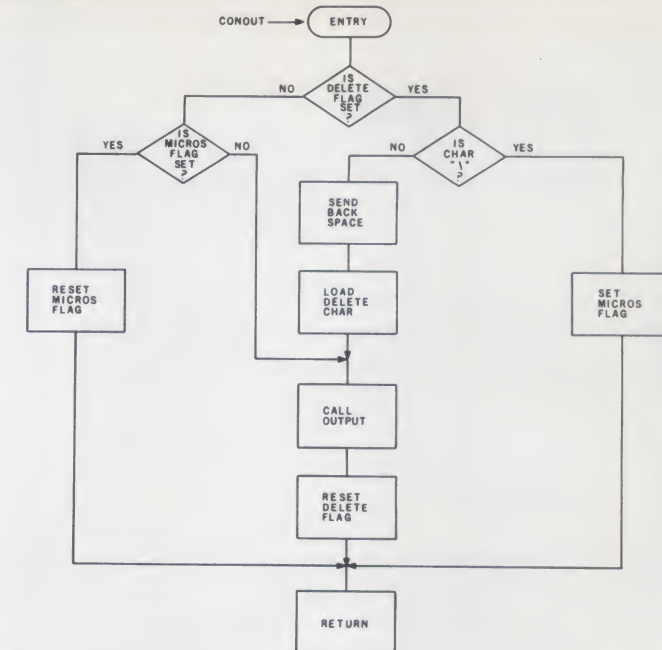


Fig. 2. Flowchart of the modified screen output routine.

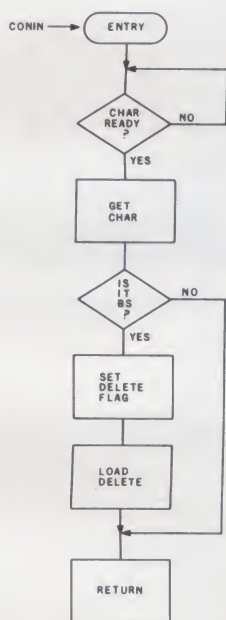


Fig. 1. Flowchart of the modified keyboard routine.

backslash comes along, it will be ignored also because the DELETE FLAG will be reset and the MICROS FLAG will be set. At this time, reset the MICROS FLAG and exit.

An unexpected benefit of this modification came up in connection with ED.COM, the CP/M text editor. Since my new keyboard routine converts Back Spaces to Deletes, Back Space also works within the body of an ED.COM text file while editing. However, Back Space is 08H, which is also the code for a Control H, the block move code used within the body of an Electric Pencil text file.

The modification I'm describing here will effectively

eliminate the block move instruction, which is not good. Therefore, I have an unmodified CP/M CBIOS on the disk that contains the Electric Pencil II word processing system so it will work properly.

Figure 1 is a flowchart of the keyboard input routine, and Fig. 2 is the screen output routine.

That's all there is to it. If you have done any assembly-language programming, you shouldn't have any trouble modifying your CP/M CBIOS. I haven't mentioned the steps necessary to insert the new CBIOS into its proper place in the CP/M system and then get it onto your disks because it would take too long. ■

MID EAST MICRO

86 PH (219) 293-4316/ 10-8 EST / For C.O.D. INFORMATION

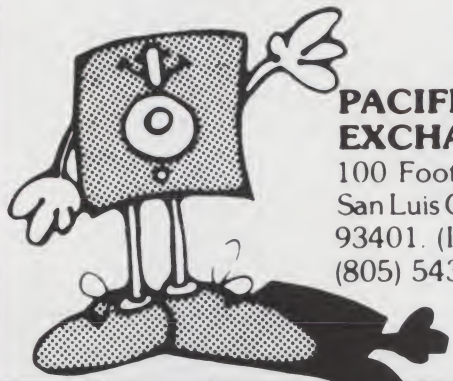
... TERMINALS/ ADDS 20....\$799/25....\$849/ HAZELTINE 1410....\$745/ 1500....\$949/ 1510....\$1049/ 1520....\$1295
 TERMINALS/ HEATH-ZENITH WH-19....\$849/ PERKINS-ELMER....\$729/ INFOTON 100....\$849/ MICRO TERM ACT5....\$749
 TERMINALS/ LEAR-SIEGLER ADM-1A....\$1359/ ADM-3.(assm.)....\$799/ ADM-31....\$1159/ LOWER CASE-NUM. PAD. (avail) .
 ... SYSTEMS/ PASCAL MICROENGINE (board)....\$1549/ CAB. & PW SUPP.... \$2295/ PASCAL PLUS (2 drives)....\$2995. . . .
 . SYSTEMS/ HEATH-ZENITH WH-89 (16K)....\$1899/ CROMEMCO SYS-3 (64K, 1.2M dr.)....\$5349/ Z2D-W (assm.)....\$1839 .
 SYSTEM/ NORTHSTAR HOZ. 1(32K DD)....\$2895/ HOR. 1(16K DD)....\$2400/ SWTC 6809(56K)....\$1695.
 PRINTERS/ TEXAS INSTRUMENTS 810....\$1529/ 820K0....\$1959/ DIABLO 1640.... \$2779/ 1650....\$2995
 PRINTERS/ NEC 5510....\$2499/ 5520K0....\$2895/ 5530P....\$2493/ HEATH-ZENITH WH-14....\$779
 PRINTERS/ CENTRONICS 730....\$775/ 799-2....\$995/ 702.... \$1725/ COMPRINT 912GP....\$499/ 912S....\$529.
 SUPPORT/ SEATTLE COMPUTER PROD.(16K memory plus 250ns static)....\$279/ CENTRONICS RIBBONS/ NEC RIBBONS .
 SUPPORT/ NEC THIMBLES/ PRINTER STANDS/ CRT WORK STATIONS/ CIRCUIT MANUALS/ RS-232 CONNECTORS. .
 SUPPORT/ T.D.M. Diskettes 8" (TRS Mod. 2) Box 10....\$45/ 8" SS Box 10....\$35/ 5 1/4" SS Box 10....\$35
 HANDLING. Freight Collect- TO ORDER. Cert./Personal Ck. / C.O.D P.O. Box 621, BRISTOL, IN 46507. .



Dysan

CORPORATION

Solve your disk problems, buy 100% surface tested Dysan diskettes. All orders shipped from stock, within 24 hours. Call toll FREE (800) 235-4137 for prices and information. Visa and Master Card accepted. All orders sent postage paid.



PACIFIC EXCHANGES

100 Foothill Blvd.
San Luis Obispo, CA
93401. (In Cal. call
(805) 543-1037)

✓ 274

SUPER SPECIAL

Apple II 16K

\$999.99



The Paper Tiger

\$950.00

With Graphics \$1090.00

DISK II
with controller

\$545.00

without controller

\$465.00

MICROMODEM

\$325.00

PASCAL

\$425.00

ROMPLUS

\$149.00

with keyboard filter

16K RAMS for
APPLE II
TRS-80

\$65

VERBATIM
DISKS
10 for

\$27

The Computer Stop
16919 Hawthorne Blvd.
Lawndale, CA 90260
(213) 371-4010

MON. - SAT.

10 - 6

TRS-80 LEVEL II \$720.

COMPLETE
SYSTEM

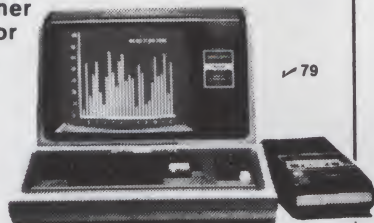
The world's most popular microcomputer, with 16K of memory and Level 11 basic for only \$720, complete with full 90 day Radio Shack warranty.

We accept check, money order or phone orders with Visa or Master Charge. (Shipping costs added to charge orders).

Disk drives, printers, peripherals, software & games... you name it, we've got it (both Radio Shack & other brands). Write or call for our complete price list.

Q&S

ELECTRONICS
MART, LTD.



✓ 79

AUTHORIZED
DEALERSHIP

Radio Shack

32 EAST MAIN • MILAN, MICHIGAN 48160 • (313) 439-1508

WHY PAY MORE?

Compare our prices and service

SOROC

IQ 120.....\$ 790.
IQ 140.....\$1190.

CENTRONICS PRINTERS

Prices too low to advertise.
Call for best price.

LIVERMORE DATA MODEMS

300 BAUD.....\$170.
RS-232, 2 yr. uncond. guarantee

BASF DISKETTES

5 1/4" 10/\$30.
8" 10/\$30.

CABLES

IEEE to Centronics.....\$100.
RS-232.....\$ 25.

COMMODORE SPECIALS FREE*

PET32K (N&B).....1295...175.
PET 16K (N&B).....995...135.
PET 8K.....795...100.
PET 2040 Disk
Drive.....1295...175.
PET 2022 Tractor
Printer.....795...100.
PET C2N Cassette
Deck.....95...12.

*Free merchandise with purchase of CBM item.

BPI GENERAL LEDGER

Accounting System for Apple
II Computers—Special...\$399.

CDS SERIES 80 IPS-100

- Main Frame
- Key Switch (ON/OFF)
- 8085 Processor
- 630,000 Byte Disks
- 10 Slot S-100 Bus
- 32K Ram
- 2 Independent RS-232 I/O Ports
- Up to Four Users
- 110 Volts 60 HZ
- 220 Volts Available
- List Price \$3295.
- Sale Price \$2700.

TO ORDER:

Send check or money order.
VISA/Master Charge/C.O.D.

**COMPUTER
PRODUCTS
INTERNATIONAL**

✓ 323

P.O. Box 17675 Washington, D.C. 20041
703-573-9633

PROGRAMMING TOOLS FOR YOUR TRS-80™

INSIDE LEVEL II

The Programmers Guide to The Level II ROMS

INSIDE LEVEL II is a comprehensive reference guide to the Level II ROMs which allows the machine language or Basic programmer to easily utilize the sophisticated routines they contain. Concisely explains set-ups, calling sequences, and variable passage for number conversion, arithmetic operations, and mathematical functions, as well as keyboard, tape, and video routines. Part II presents an entirely new composite program structure which loads under the SYSTEM command and executes in both Basic and machine code with the speed and efficiency of a compiler. In addition, the 18 chapters include a large body of other information useful to the programmer including tape formats, RAM usage, relocation of Basic programs, USR call expansion, creating SYSTEM tapes of your own programs, interfacing of Basic variables directly with machine code, a method of greatly increasing the speed at which data elements are stored on tape, and special precautions for disk systems. INSIDE LEVEL II is a clearly organized reference manual. It is fully typeset and packed with nothing but useful information. It does not contain questions and answers, ROM dumps, or cartoons. INSIDE LEVEL II.....\$15.95

PROGRAM INDEX FOR DISK BASIC

Assemble an alphabetized index of your entire program library from disk directories. Program names and free space are read automatically (need not be typed in) and may be alphabetized with a fast Shell/Metzner sort by disk or program. The list may also be searched for any disk, program, or extension; disks or programs added or deleted; and the whole list or any part sent to the printer. Finally, the list itself may be stored on disk for future access and update. "The best thing since sliced bread" (January issue of '80 Microcomputing). One drive and 32K required. INDEX.....\$19.95

SINGLE STEP THROUGH RAM OR ROM WITH STEP80

STEP80 allows you to step through any Basic or machine language program one instruction at a time, and see the address, hexadecimal value, Zilog mnemonic, register contents, and step count for each instruction. The top 14 lines of the video screen are left unaltered so that the "target program" may perform its display functions unobstructed. STEP80 will follow program flow right into the ROMs, and is an invaluable aid in learning how the ROM routines function. Commands include step (trace), disassemble, run in step mode at variable step rate, display or alter memory or CPU registers, jump to memory location, execute a CALL, set breakpoints in RAM or ROM, and relocate to any page in RAM. The display may also be routed to your line printer through the device control block so custom print drivers are automatically supported. STEP80.....\$16.95

MACHINE LANGUAGE FAST FOURIER TRANSFORM

This complete package includes 3 versions of the machine language FFTASM routine assembled for 16, 32, and 48K machines, a short sample Basic program to access them, a 10K Basic program which includes sophisticated interactive graphing and data manipulation, and a manual of instructions and examples. The machine language subroutines use variables defined by a supporting Basic program to make data entry and retrieval extremely fast and easy for custom implementation. They perform 20 to 40 times faster than their Basic equivalent (256 points in 12.5 seconds), and require less than 1550 bytes of memory. FFTASM.....\$49.95

4 SPEED OPTIONS FOR YOUR TRS-80!

The SK-2 is the most versatile clock modification available for the TRS-80. Speeds may be switched between normal, an increase of 50%, or a 50% reduction; selectable at any time without interrupting execution or crashing the program. Instructions are also given for a 100% increase to 3.54 MHz, though the TRS-80 is not reliable at this speed. The SK-2 may be configured by the user to change speed with a toggle switch or on software command. It will automatically return to normal speed any time a disk is active, requires no change to the operating system, and has provisions for adding an LED to indicate when the computer is not at normal speed. It mounts inside the keyboard unit with only 4 necessary connections for the switch option (switch not included), and is easily removed if the computer ever needs service. The SK-2 comes fully assembled with socketed IC's and illustrated instructions. SK-2.....\$24.95

RAM SPOOLER FOR PARALLEL OR SERIAL PRINTERS

This program is a full feature print formatting package featuring user definable line and page length (with line feeds inserted between words or after punctuation), screen dump, and printer pause control. The serial version allows baud rate selection from the keyboard. In addition, printing is done from a 4K expandable buffer area so that the LPRINT or LLIST command returns control to the user while printing is being done. Ideal for Selectric or other slow printers. Allows printing and processing to run concurrently. Please specify PARALLEL or SERIAL (RS-232 interface) version. SPOOLER.....\$16.95

DUPLICATE SYSTEM TAPES WITH "CLONE"

Make duplicate copies of ANY tape written for Level II. They may be SYSTEM tapes (continuous or not) or data lists. The file name, load address, entry point, and every byte (in ASCII format) are displayed on the video screen. CLONE.....\$16.95

RAM TEST FOR LEVEL II

This machine language program is a very thorough test for several types of RAM errors. A complete test of each individual bit in a 48K machine takes just 14 seconds. Includes a separate test for power line glitches. RAMTEST.....\$9.95

FOR THE MODEL II

LYNC

from Midnight Software

High level data communications for Model IIs with CP/M. LYNC will send and receive any file with automatic error checking and retries. Either end may initiate transfers, and multiple files may be sent with wildcard filenames and direct or indirect listing. Remote or local directories may be called from within the program. Features full protocol, non-protocol file transfer, and real-time conversation modes. May be used over phone lines at 300 baud or direct to another computer at up to 9600 baud. Also available for other CP/M computers. LYNC.....\$95.00

**MUMFORD
MICRO
SYSTEMS**

ORDERING: Complete satisfaction is guaranteed or a full refund will be made. All programs are shipped on cassette unless \$5 is included for a formatted (no system) disk. Include \$1 postage and handling. California residents add 6% sales tax. Visa, Mastercharge and COD orders accepted.

Box 435-C Summerland, California 93067 (805) 969-4557

Level II BASIC On a Z-80 System

Although the author used Radio Shack's three-ROM BASIC, the two-ROM version should work as well.

Richard J. Uschold
80 Woodview Dr.
Port Orange, FL 32019

Since I have been a dedicated hardware hacker for many years, I just had to build my own computer. I started designing at Christmas in 1976. By September 1977 I had my computer basically working, and by Christmas 1977 it was working in BASIC. It was a 2K Tiny BASIC interpreter, but it was better than nothing.

After about a year of using my Tiny BASIC, I decided I was

ready for a real BASIC. Since I had chosen the Z-80 microprocessor for my computer, I could use any BASIC written for the 8080 or the Z-80.

There were a number of BASICs available that required from 8K to 24K of memory at prices from \$50 to several hundred dollars. I really liked the idea of having the BASIC in ROM so that I wouldn't have to load it from tape every time, which seemed to take forever. (Even with my 2400 baud cassette interface, programs longer than 4K become annoying!) This

meant I had to either use EPROMs or buy the BASIC already in ROM. The EPROMs would cost upwards of \$80, plus the price of the BASIC.

There was only one BASIC offered in ROM that I knew of, although I had heard rumors of another one coming soon. The rumors have since become fact, and Livermore BASIC is now available on an 8K byte ROM for \$95. I bought the other one, Radio Shack's Level II BASIC, for \$89.10. (Several companies offer ten percent off Radio Shack's original \$99 price. Radio Shack has since raised the price to \$120.)

Radio Shack's Level II BASIC has another significant advantage—software availability. Since it is the most popular microcomputer around today, it has much software designed for it. Also, many programs not originally written for it are being offered in compatible forms (for example, the CP/M disk operating system and the Electric Pencil).

In this article, I will describe how I interfaced the Level II ROMs to my computer, even though my hardware bears little resemblance to that of the TRS-80. I will also give some hints to those computerists whose hardware doesn't resemble mine either!

Preliminary Work

Before I bought the Level II ROMs, I did some preliminary investigation, which included re-reading articles that described

the TRS-80 hardware and software. I also bought and read the "TRS-80 Microcomputer Technical Reference Handbook" published by Radio Shack. All of this material provided several important pieces of information.

First, the TVT was a more or less standard type of memory-mapped interface, which, I figured, should present no problems.

Second, the keyboard was an unorthodox arrangement with the key matrix directly mapped in memory (see Fig. 1). I figured I could write a program to take ASCII data from my keyboard and calculate the required memory bits to set so that the ROM could find the bits in memory and convert them back to ASCII (a kludge, but it worked!).

Third, the cassette interface was software timed and would require a different clock rate on my processor or else some software patches to get the timing right.

Finally, and perhaps most importantly, the ROMs were located in memory at address 0000H. This meant I would have to move my monitor, which was now there, to another address. I moved it to F000H. This required a reset vector other than 0000H to initialize to the monitor.

The circuit I used was described in the September 1977 *Kilobaud* ("Using an Invisible PROM," p. 106, by Jack Regula). My version is in Fig. 2. I spent the next month or so rewriting and improving my monitor. When I had it just right, I put it in

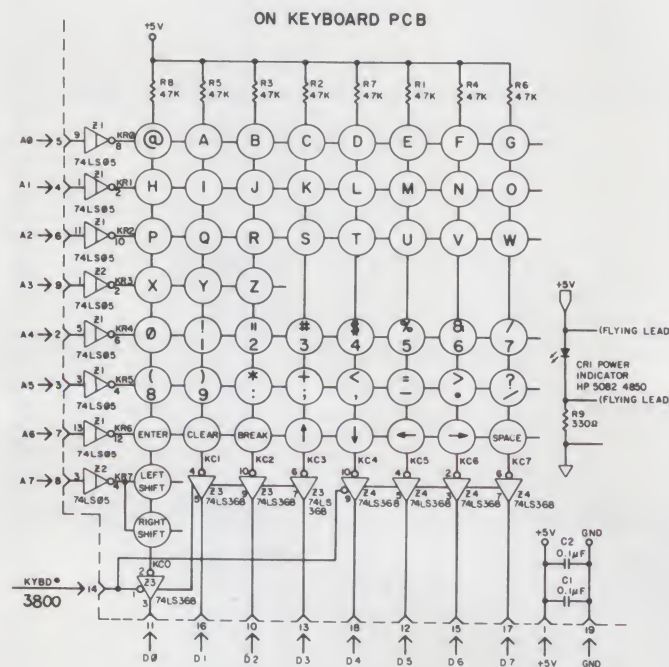


Fig. 1. TRS-80 keyboard connected to the address and data buses. (Reprinted from the "TRS-80 Technical Reference Manual," courtesy Radio Shack.)


```

00100 ; TRS-80 KEYBOARD SIMULATOR INTERRUPT ROUTINE
00110 ; BY RICHARD J. USCHOLD
00120      ORG 0F776H
00130 TKEINT  PUSH HL      ; SAVE REGISTERS
00140      PUSH AF
00150      PUSH BC
00160      LD A,3CH      ; MASK KBD AND LOWER INTS
00170      OUT (INTMSK),A ; FOR MY SYSTEM ONLY
00180      EI
00190      XOR A      ; CLEAR A
00200      LD B,8      ; LOOP COUNT
00210      LD HL,3801H  ; KBD MEMORY ADDRESS
00220 CLRLOP  LD (HL),A  ; CLEAR KBD ADDRESS
00230      RLC L      ; GENERATE NEXT ADDRESS
00240      DJNZ CLRLOP
00250      LD L,0FFH   ; KEY PRESSED BYTE
00260      LD (HL),A   ; CLEAR IT
00270      IN A,(KBD)  ; GET DATA FROM KEYBOARD
00280      LD C,A      ; SAVE DATA
00290      BIT 7,A     ; CHECK ALL SHIFT BIT
00300      JR Z,NASHFT ; NOT ALL SHIFT
00310      LD A,1      ; YES-SHIFT BIT DATA
00320      LD L,80H    ; SHIFT ADDRESS
00330      LD (HL),A  ; SET SHIFT BIT
00340      RES 7,C     ; CLEAR ALL SHIFT BIT
00350      LD A,C      ; GET DATA
00360 NASHFT  CP LFBKRT ; UPPER LIMIT CHARACTER
00370      JR NC,VALIDQ ; ONLY ONE VALID ABOVE THIS
00380      CP ATSN     ; CHECK IF ALPHABETIC
00390      JR C,NORLPH
00400      RRC A      ; /2 - YES, GENERATE
00410      RRC A      ; /4 - ADDRESS BIT
00420      RRC A      ; /8
00430      AND 03     ; MASK ALL BUT TWO BITS
00440      INC A      ; ADJUST COUNT TRUE
00450      LD B,A     ; SET UP LOOP COUNT
00460      XOR A      ; CLEAR A
00470      SCF       ; CARRY TO BE SHIFTED IN
00480 GENADR  RLA     ; GENERATE ADDRESS BIT
00490      DJNZ GENADR
00500      LD L,A      ; SAVE ADDRESS
00510 DATA  LD A,C   ; RESTORE ASCII DATA
00520      AND 07     ; MASK ALL BUT THREE BITS
00530      LD B,A     ; MOVE TO COUNTER
00540 DATA  XOR A    ; CLEAR A
00550      SCF       ; CARRY TO BE SHIFTED IN
00560      INC B     ; MAKE COUNT TRUE
00570 GENDAT  RLA     ; GENERATE DATA BIT
00580      DJNZ GENDAT
00590      LD (HL),A  ; SET BIT IN MEMORY
00600      LD L,0FFH  ; KEY PRESSED BYTE
00610      LD (HL),A  ; SET KEY PRESSED BIT
00620 INVALID POP BC  ; RESTORE REGISTER
00630      JP KBINT1  ; FINISH BY DOING NORMAL
00640      ; KEYBOARD INTERRUPT ROUTINE
00650 NORLPH  CP '!'  ; IS IT CONTROL?
00660      JR C,CTRL  ; YES
00670      BIT 3,A    ; NUMERIC OR SPECIAL?
00680      JR NZ,NONUM
00690      BIT 4,A    ; CHECK IF SHIFT
00700      LD B,10H  ; SAVE ADDRESS BIT
00710      JR NZ,NASHFT
00720 SHFT  LD L,80H ; SHIFT ADDRESS
00730      LD A,1    ; SHIFT BIT
00740      LD (HL),A ; SET SHIFT BIT
00750      LD L,B    ; SET ADDRESS BIT
00760      JR DATA  ;
00770      LD B,20H  ; SAVE ADDRESS BIT
00780      AND 14H   ; CHECK IF SHIFT
00790      JR Z,SHFT ;
00800      XOR 14H   ; CHECK IF SHIFT
00810      JR Z,SHFT ;
00820      JR NASHFT ;
00830 VALIDQ  CP RUBOUT ; THIS IS BACK ARROW KEY
00840      JR NZ,INVALID
00850 CNTRL  LD HL,CTRLTB ; TABLE ADDRESS
00860      LD BC,8    ; LOOP COUNT
00870      CP IR     ; SEARCH TABLE FOR MATCH
00880      JR NZ,INVALID ; NOT FOUND
00890      LD HL,3840H ; CONTROL BIT ADDRESS
00900      LD B,C     ; LOAD LOOP COUNT
00910      JR DATA  ; COMPUTE BIT AND FINISH
00920 CTRLTB DEFB SPACE
00930      DEFB RTAROW
00940      DEFB RUBOUT
00950      DEFB LF
00960      DEFB UFAROW
00970      DEFB ESC
00980      DEFB ENQ
00990      DEFB CR
01000 INTMSK EQU 19H
01010 KBD    EQU 4
01020 LFBKRT EQU 56H
01030 RUBOUT EQU 7FH
01040 SPACE  EQU 20H
01050 RTAROW EQU 9
01060 LF     EQU 10
01070 UFAROW EQU 0BH
01080 ESC    EQU 1BH
01090 ENQ    EQU 5
01100 CR     EQU 0DH
01110 ATSN   EQU 40H
01115 ; -----
01120 ; THIS IS THE NORMAL KEYBOARD INTERRUPT SERVICE ROUTINE
01130      ORG 0FC9CH
01140 KBDINT  PUSH HL
01150      PUSH AF
01160 KBINT1  LD HL,KBDAT ; SAVE ADDRESS FOR DATA
01170      IN A,(KBD)      ; GET DATA
01180      LD (HL),A       ; SAVE IT
01190      CP CTRLZ       ; TO RETURN TO MONITOR
01200      LD A,10H       ; ENABLE ALL INTERRUPTS
01210      OUT (INTMSK),A
01220      JR Z,TOMON     ; IT WAS CONTROL Z
01230      DEC HL         ; POINT TO STATUS WORD
01240      SET 0,(HL)     ; SET KBD FLAG
01250      POP AF
01260      POP HL
01270      EI            ; ENABLE INTERRUPTS
01280      RET           ; RETURN FROM INTERRUPT
01290 TOMON  POP AF     ; RESTORE REGISTERS
01300      POP HL        ; FOR SAVE ROUTINE
01310      JP RGSAVE    ; SAVE REGISTERS AND GO TO MONITOR
01320 KBDAT  EQU 0F03AH
01330 CTRLZ EQU 1AH
01340 RGSAVE EQU 0F0C9H
01350      END

```

Listing 1. TRS-80 Keyboard Simulator program converts the ASCII data from my keyboard to the memory-mapped bits expected by the Level II BASIC ROM. Program is simpler than it might have been due to the logical placement of the keys in the keyboard matrix (see Fig. 1).

EPROM, and I ordered the Level II ROMs.

Getting Ready

While waiting for the ROMs to arrive, I wrote a couple of programs to simulate the TRS-80 hardware, and I made a couple of hardware modifications to my computer in those areas that could not be readily done with software. The first program, in Listing 1, simulated the TRS-80

memory-mapped keyboard. This program is an interrupt driver that must be used as such. The program exits by jumping to my normal keyboard interrupt routine.

As you can see, the normal routine checks for a control-Z character and jumps to the monitor if it detects one. This is an invaluable feature of my monitor. This allows me to always jump back to the monitor if for

some reason the executing program hangs up (except if it disables interrupts or destroys the monitor RAM area).

If you don't have an interrupt-driven keyboard, you can't use the program in Listing 1, but don't worry, you can still put Level II on your computer. It is highly desirable that you have some method of interrupting the computer, saving the registers, etc., and jumping back to your

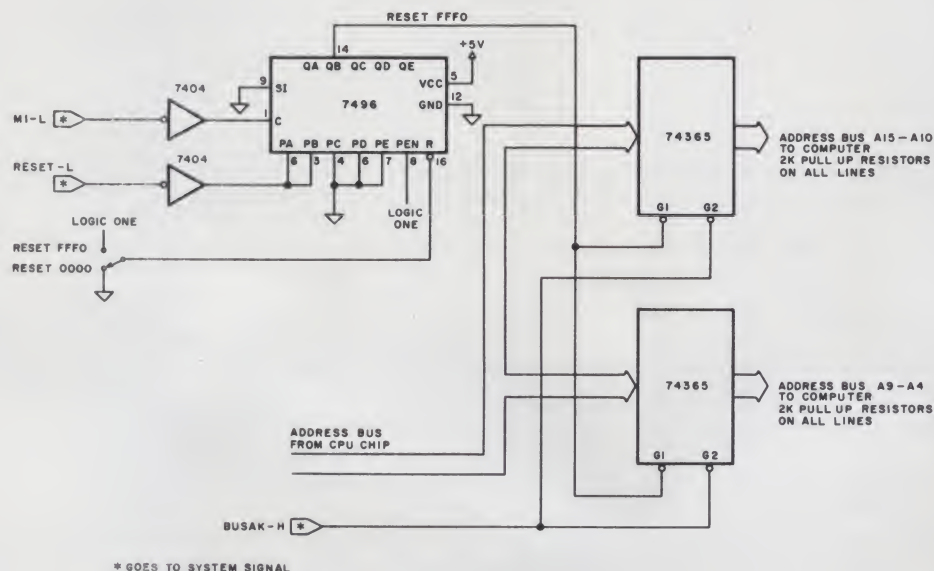
monitor. It is also necessary that you use interrupt mode 2 on the Z-80, since the other interrupt locations are used by Level II BASIC.

If you use Listing 1 with most keyboards, you will not be able to enter the same character twice in a row! The reason for this is because when the program sets the bits in memory to simulate the TRS-80 keyboard, it never resets the bits until the


```

00100 ,BASIC INITIALIZATION ROUTINES
00110 ,RICHARD J. USCHOLD
00120 PCG EQU 1CH
00130 SPACE EQU 0F82FH
00140 CHIN EQU 0F859H
00150 JP1GRT EQU 0F8CFH
00160 VIDVEC EQU 401EH
00170 INITVT EQU 0FD00H
00180 TVT EQU 14H
00190 PRIVEC EQU 402GH
00200 LINEPP EQU 4028H
00210 KB0VEC EQU 4016H
00220 JMP4 EQU 0FC59H
00230 KB0ST EQU 0F039H
00240 RUBOUT EQU 7FH
00250 BS EQU 8
00260 ENQ EQU 5
00270 CHRCNT EQU 402AH
00280 TYP0UT EQU 0F86EH
00290 OK EQU 0F04AH
00300 L2VID EQU 33H
00310 TRHDLR EQU 4012H
00320 INTMSK EQU 18H
00330 BOOT EQU 69FH
00340 SVPc EQU 0F051H
00350 DELAY EQU 60H
00360 CRET EQU 00H
00370 TRSCRS EQU 0FFH
00380 VIDJMP EQU 0F06EH
00390 UPAROW EQU 5EH
00400 NMIVEC EQU 66H
00410 ,GENERATE TRS-80 GRAPHICS
00420 ORG 0F5E9H
00430 BASIC IN A,(PCG+2) ;DISABLE WRITE PROTECT ON
00440 ,PROGRAMMABLE CHARACTER GENERATOR
00450 LD HL,33FFH ;LAST PRG CHR ADDRESS
00460 LD C,0FFH ;DATA FOR LAST CHARACTER
00470 LD D,40H ;64 CHARACTER COUNT
00480 MAINLP LD E,4 ;4 DOT ROWS PER CHAR COUNT
00490 CHARLP LD B,2 ;SHIFT LOOP COUNT
00500 SHFTLP RLC C ;GET DATA TO CARRY
00510 RRA ;ROTATE CARRY TO ACC
00520 SRA A ;COPY BIT TO FOUR PLACES
00530 SRA A
00540 SRA A
00550 DJNZ SHFTLP ;DO NEXT FOUR BITS
00560 LD B,4 ;4 LINES PER DOT ROW COUNT
00570 DOTLOP LD (HL),A ;LOAD DATA TO PRG CHR
00580 DEC HL ;BUMP TO NEXT ADDRESS
00590
00600 DJNZ DOTLOP ;DO 4 LINES
00610 DEC E ;CHARLOOP COUNTER
00620 JR NZ,CHARLP
00630 LD A,C ;GET DATA FOR NEXT ROW
00640 SUB 41H ;GENERATE NEXT DOT ROW
00650 LD C,A ;SAVE NEXT DOT ROW
00660 DEC D ;MAIN LOOP COUNTER
00670 JR NZ,MAINLP
00680 IN A,(PCG+3) ;PROTECT MEMORY
00690 ,BASIC COMMAND DECODE - THE NEXT TWO LINES ARE PARTICULAR TO MY MONITOR
00700 CALL SPACE ;TYPES A SPACE
00710 CALL CHIN ;GET A CHARACTER FROM KEYBOARD AND ECHO IT
00720 CP 'C' ;FOR CONTINUE
00730 JR Z,RETBAS ;GO BACK TO BASIC
00740 CP 'I' ;FOR INITIALIZE
00750 JP Z,0001 ;INITIALIZE BASIC
00760 CP 'R' ;FOR RESET
00770 JR NZ,JP1GRT ;ILLEGAL CHARACTER
00780 ,THIS ROUTINE PRINTS ILLEGAL CHARACTER MESSAGE AND RETURNS TO THE MONITOR FOR THE NEXT COMMAND
00790 JP NMIVEC ;TRS-80 RESET SWITCH
00800 NOP
00810 NOP
00820 NOP
00830 RETBAS LD HL,VIDPCH ;INIT VIDIO PATCH
00840 LD (VIDVEC),HL ;CHANGE TRS VECTOR
00850 CALL INITVT ;THIS SETS UP MY TVT AND
00860 ;CLEARS THE SCREEN. THIS IS PARTICULAR TO MY TVT AS IS THE NEXT LINE
00870 LD A,0CEH ;NO SCROLL, CURSER OFF
00880 OUT (TVT+2),A
00890 ,THIS NEXT SECTION SETS UP A JUMP ADDRESS SO I CAN SWITCH BETWEEN THE NORMAL SPACE
00900 ,COMPRESSION CODES OR 64 MORE PROGRAMMABLE CHARACTERS
00910 LD HL,VIDJMP ;JUNK TO 0446 DOES SPACE
00920 LD (HL),0C3H ;COMPRESSION CODES, JUMP
00930 INC HL ;TO 047D DOES PROGRAMMABLE
00940 LD (HL),0A6H ;CHARACTERS, FROM BASIC,
00950 INC HL ;POKE -3988,125 FOR PRG
00960 LD (HL),04H ;CHRS, POKE -3988,166
00970 ;FOR TABS
00980 LD HL,TRSPRT ;PRINTER DRIVER
00990 LD (PRIVEC),HL
01000 LD HL,KB0SUB ;KEYBOARD SUBSTITUTE DRIVER
01010 LD (KB0VEC),HL ;CHANGE TRS VECTOR
01020 LD A,57
01030 LD (LINEPP),A ;PRINTER LINES PER PAGE
01040 NOP
01050 JP JMP4 ;THIS IS THE SECTION IN
01060 ,MY MONITOR WHICH RESTORES THE REGISTERS AND RETURNS TO THE MAIN
01070 ,PROGRAM - AS FROM A CONTROL Z INTERRUPT.

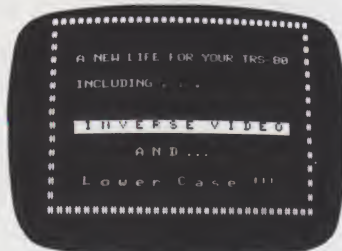
```



There are several solutions to this problem. I modified my keyboard so it gives a second data strobe when a key is released. This will strobe in a null, and the program will clear the memory when the key is released. Another solution is to hit any key on the keyboard that is not encoded by the program. This will clear the memory and leave it that way. This is only necessary if you wish to hit the same character twice in a row.

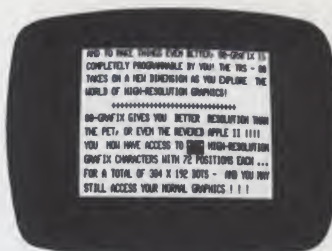
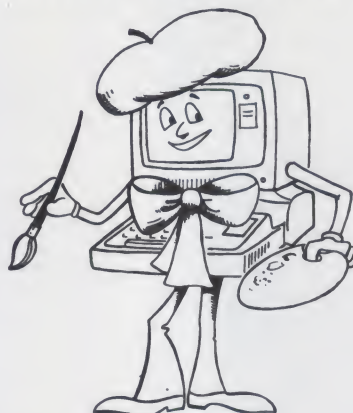
Fig. 2. Alternate reset vector circuit. Address FFF0 must be in PROM and contain a three-byte jump instruction to the start of the monitor.

FROM **PROGRAMMA** HI-RESOLUTION GRAPHICS FOR THE TRS-80®



LOWER CASE

The 80-GRAFIX board includes two sets of lower case characters at no additional cost.



INVERSE VIDEO

The 80-GRAFIX board allows you to do inverse video to high-light your screen displays.



DEMONSTRATION PROGRAMS

The 80-GRAFIX board is supplied with a Character Generator software and several demonstration programs.

FINALLY, AT LAST...

HI-RESOLUTION GRAPHICS is available for your TRS-80 computer system. The 80-GRAFIX board from PROGRAMMA International, Inc. gives your TRS-80 high resolution capability that is greater than the Commodore CBM/PET or even the revered APPLE II.

80-GRAFIX gives the TRS-80 an effective screen of 384X192 pixels, versus the normal 127X192 for the TRS-80, 80X50 for the CBM/PET, or the 280X192 of an APPLE II. As an added feature, 80-GRAFIX offers you lower case characters at no additional cost. Of course, you can also create your own set of up to 64 original characters using the supplied Character Generator software.

The 80-GRAFIX board is simple to install (note that this voids your Radio Shack warranty), and programming is done through BASIC. 80-GRAFIX opens up a whole new realm of software development and excitement never dreamed of for the TRS-80!



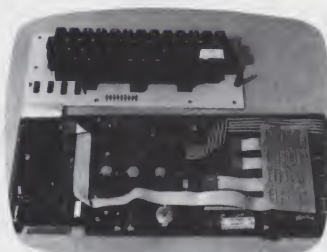
CHARACTER GENERATOR

The supplied character generator software allows you to create your own character set of up to 64 original characters.



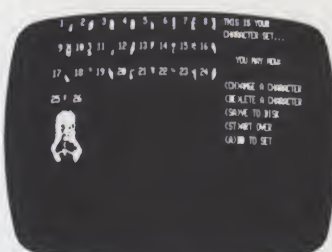
REAL-TIME GRAPHIC GAMES

With the 80-GRAFIX board you can write exciting real-time games using BASIC.



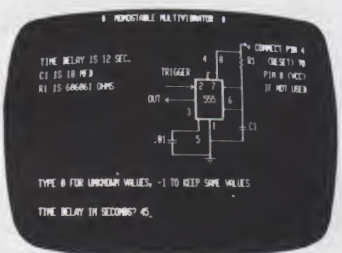
EASY INSTALLATION

The 80-GRAFIX board is simple to install and fits inside the TRS-80 case.



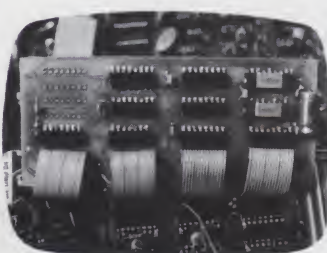
GRAPHICS GALORE

The 80-GRAFIX board and the supplied Character Generator allow you to become an artist.



ELECTRONIC DESIGN

The 80-GRAFIX board has unlimited application in Electronic design and Education.



80-GRAFIX HI-RESOLUTION

Finally, the only means to protect your computer investment is to order an 80-GRAFIX board TODAY!



EXCITEMENT & FUN

Open up a new realm of software development with the 80-GRAFIX board.

Available exclusively through **PROGRAMMA** at the cost of \$149.95
Please check with us for availability prior to ordering
VISA and MASTERCHARGE accepted
TRS-80 is a registered trademark of the Tandy Corp.

PROGRAMMA INTERNATIONAL, INC.

3400 Wilshire Blvd.
Los Angeles, CA 90010
(213) 384-0579 • 384-1116 • 384-1117



Photo 2. My completely home-brew system. The first board contains the TVT and programmable character generator. Board 2 has my front panel logic, the interrupt logic, EPROM programmer, two serial ports and the cassette interface, which supports Kansas City Standard, Tarbell, PE2400 Radio Shack Level II and CUTS with a slight mod. The third board contains the Z-80 CPU chip, 10K of static RAM, 3K EPROM, the clock switch and "No Memory" interrupt circuit. Board 4 is a 12K static RAM board. The fifth board contains a joystick interface, Level II ROMs, alternate reset circuit, floppy disk interface, real-time clock and sockets for 32K of dynamic RAM.

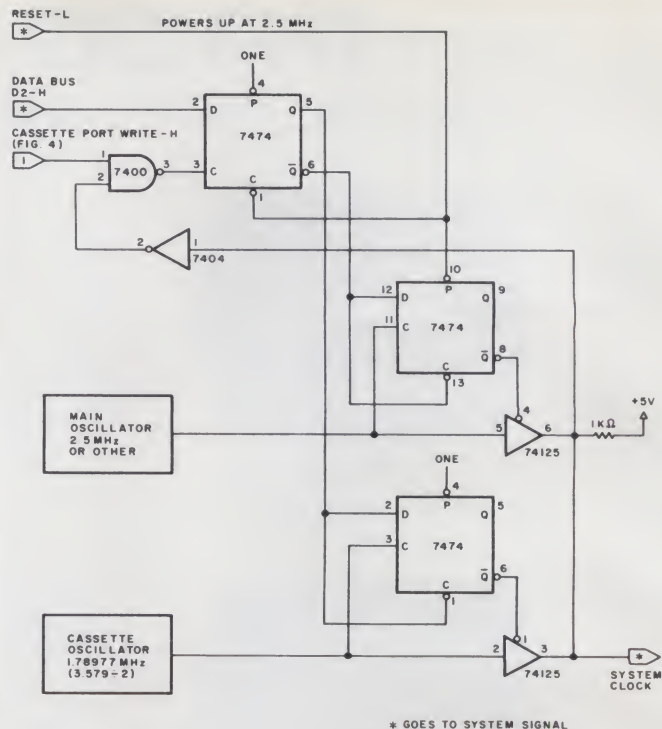


Fig. 3. Clock switch circuit automatically switches the clock from the normal frequency (2.5 MHz on my system) to 1.79 MHz when I/O port FF is written with bit 2 set. It switches back when port FF bit 2 is reset. This bit is the TRS-80 cassette motor control bit.

I'll tell you what you should use and what I am now using.

Another noteworthy feature about this program is the shift. The TRS-80 keyboard program

generates lowercase characters if the shift key is pushed with a regular key. It also generates special control characters when the shift is pushed with the arrow keys.

I handled this by using the eighth bit as the shift bit. My keyboard has an extra key that sets the eighth bit when pushed. Most keyboards don't have this.

The second program I wrote while waiting for the ROMs is an initialization of my system so that the ROMs will think they are hooked up to a TRS-80. Listing 2 essentially is the program, although it is a little bit different. I changed it slightly after I got the ROMs and learned a few things I didn't originally know.

The first part of the program initializes my programmable character generator to simulate the TRS-80 graphics characters. The programmable character generator is essentially the same as the one described in *Byte* magazine (May and June 1978). There are 128 programmable characters that can be printed by sending the codes 80H-FFH to the video driver or directly loading these codes in

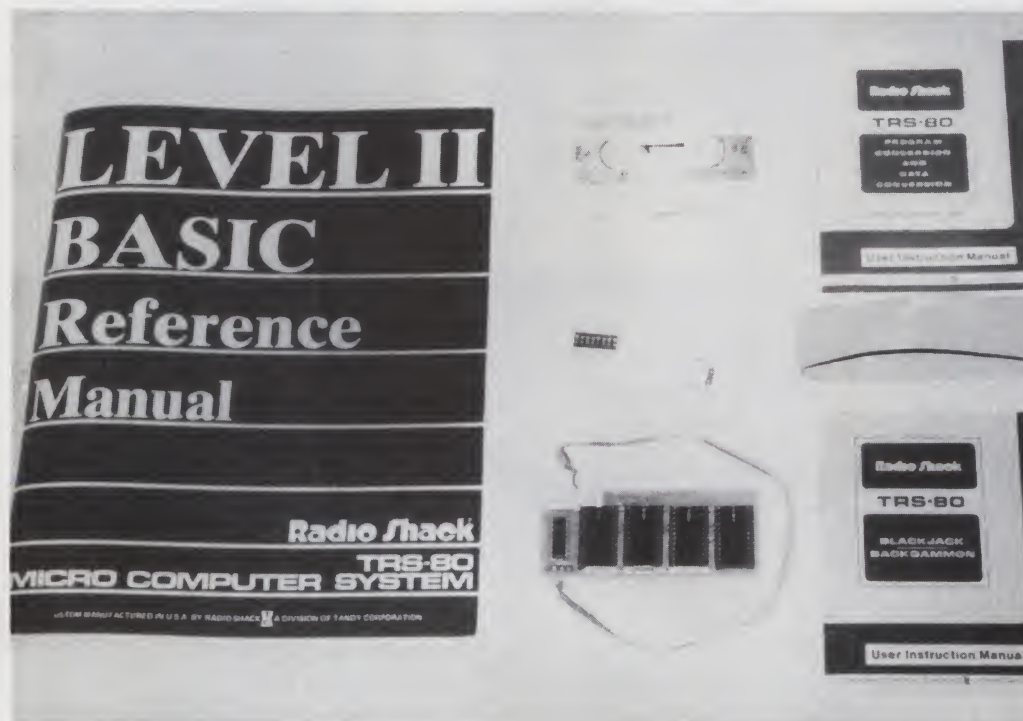


Photo 1. Level II kit. ROMs have been removed from the circuit board. (Photos by Michael Tabellion).

The required clock rate is one-eighth the rate of my TVT clock, so I didn't require another oscillator. The required clock is also one-half the color burst frequency. There are inexpensive crystals available that you can use; 3.579 MHz color burst crystals cost less than \$2.

After calling the company twice, asking where my order was, I finally received the ROMs, which came on a small circuit board with a 24-pin jumper cable

and another four-wire ribbon cable. No instructions came with the kit; however, the handbook shows a schematic of the circuit board (Fig. 5). There are also other items, including an unprogrammed DIP header and a resistor, in the kit (see Photo 1). The DIP header alters the ROM decode in the TRS-80; I'm not sure what the resistor is used for. Anyway, I didn't use either of these.

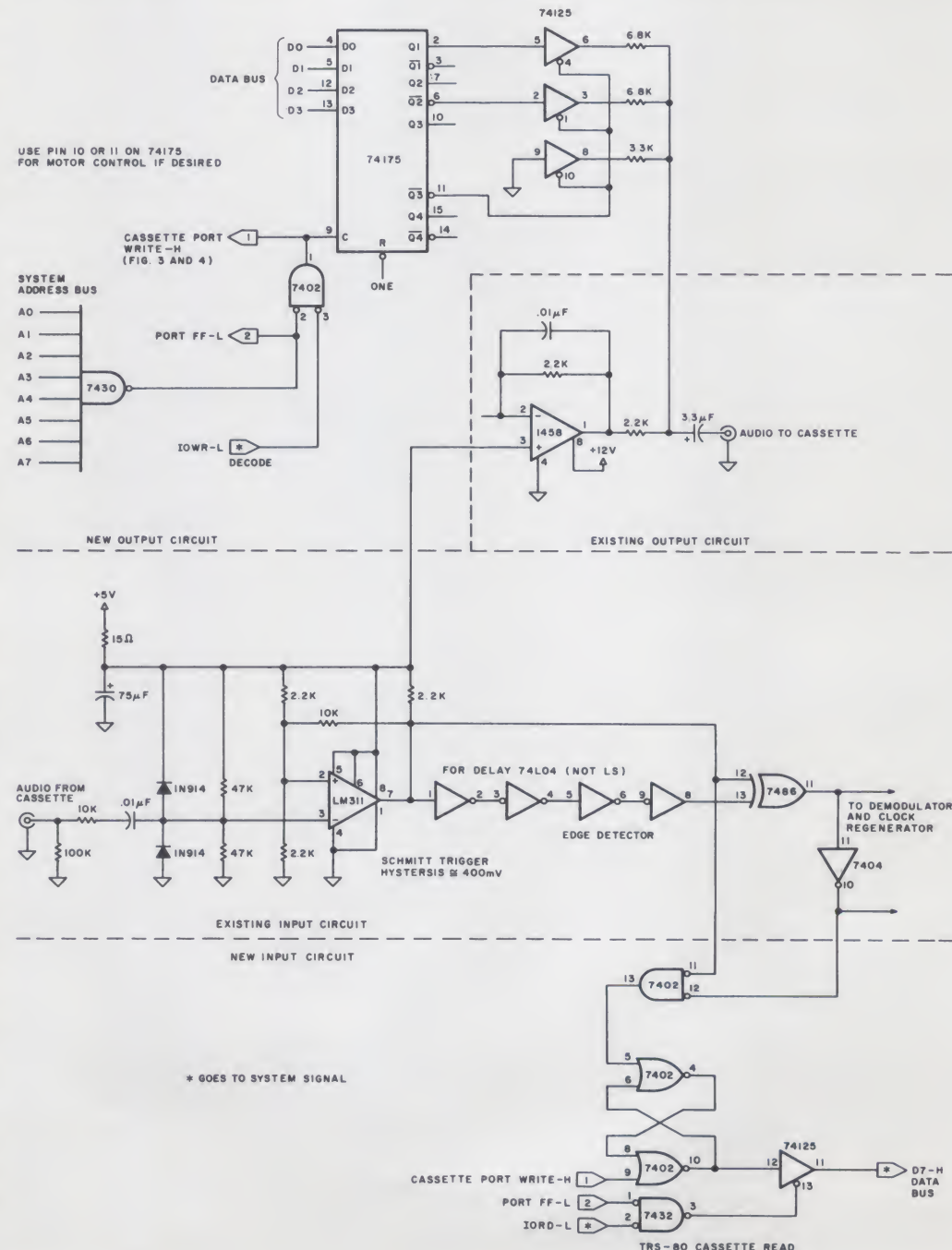


Fig. 4. Cassette output circuit similar to the TRS-80. I added the Tri-state buffers and changed the resistor values a bit so I could wire it directly to my existing output circuit. You can use bit 2 for cassette motor control if you wish.

Also included are three prerecorded cassettes with some very brief instructions on how to use them. One cassette contains Blackjack and Backgammon. The other two cassettes are for conversion of Level I programs and data to Level II for-

mat. I haven't had a need for these two yet, though I have used the games a few times. Finally, there is the "Level II Reference Manual," along with errata sheets, containing useful information.

The small circuit board didn't

seem to fit anywhere in my system, so I wired up three sockets and just removed the ROMs. A friend had given me a poor copy of a copy containing a hex dump of the ROMs and partial disassembly of the initialization portion of the program. The

first thing I did was to check the first few bytes in each ROM. They matched! Next, I ran off a hex dump of my own so I could read it without straining my eyes.

There was one more thing I wanted to do before I actually tried to execute the program contained in the ROMs. From all the information I had acquired, I knew that the TRS-80 used interrupts only when it had the expansion interface connected. Also, it only used interrupt mode 1 on the Z-80 chip. Since my system would only work if I used interrupt mode 2, I searched the ROMs for any instructions that affected the interrupts. There were two: a disable interrupts at 0000H and an enable interrupts at 06E4H.

The enable interrupt instruction is actually the interrupt service routine, which is moved to RAM during the initialization. The routine merely enables interrupts and returns. This is modified when interrupts are needed. What all this boils down to is that I shouldn't have any problems with my interrupt-driven keyboard as long as I start the ROM at 0001H.

The Big Moment

So, I tried it. The screen cleared, and a short message appeared in the upper-left corner. It said, "ξζξππ√ υκ→ζ?..." My computer was talking to me in Greek! There was obviously some incompatibility between the TRS-80 video driver and my TVT. The Level II manual tells me that the computer is supposed to say, "MEMORY SIZE?..." Anyway, I responded with a "32000," which appeared on the screen just as I typed it.

Hmmm, my keyboard kludge was working alright and the numerals printed correctly, but the alphabet was in Greek! I hit the carriage return. Nothing happened for a moment, then another couple lines of Greek appeared.

You may be wondering where the Greek was coming from. Well, that is an easy one. The character generator ROM I bought for my TVT has Greek characters and some special math symbols where the control

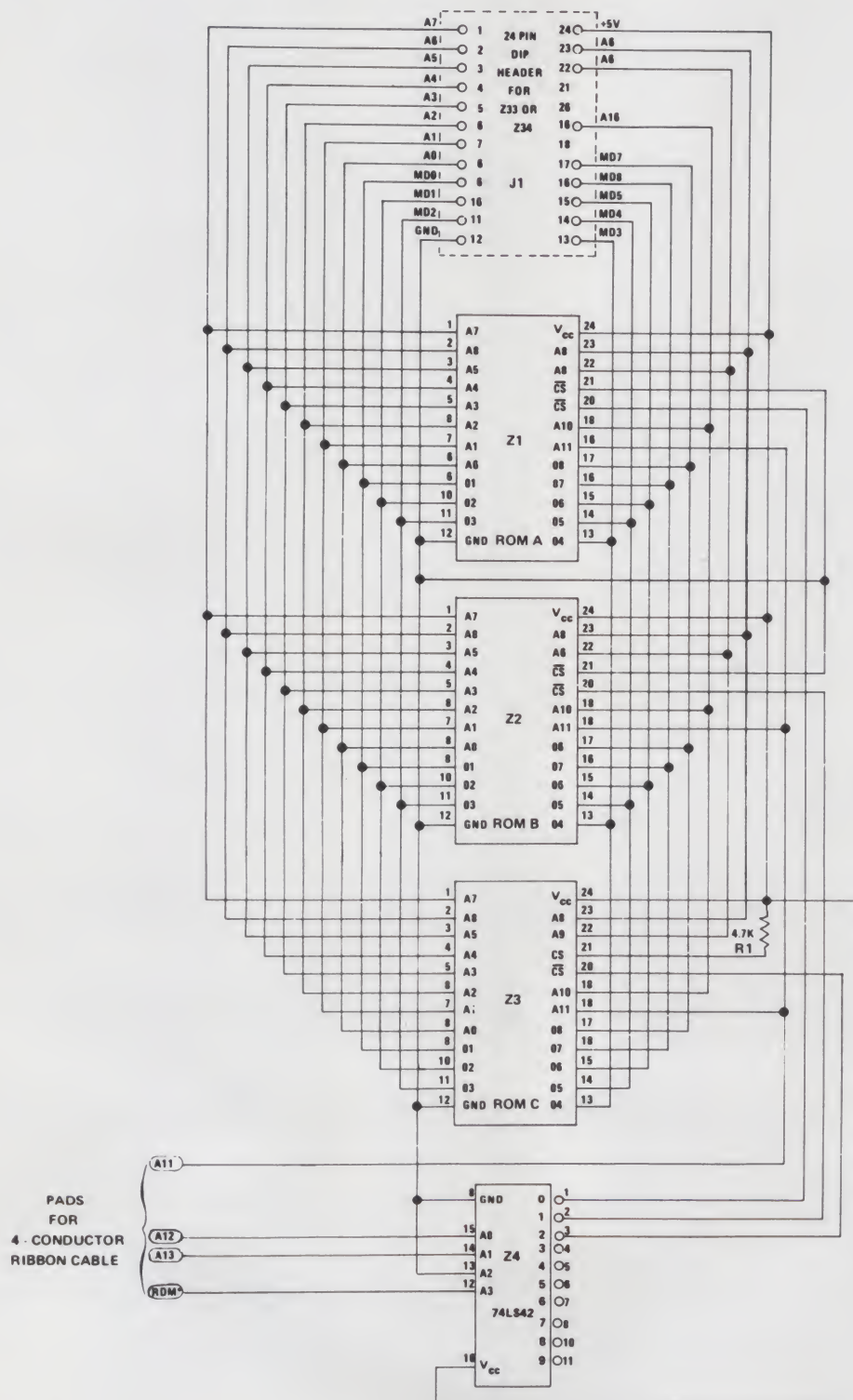


Fig. 5. Level II BASIC schematic. (Reprinted from the "TRS-80 Technical Reference Handbook," courtesy Radio Shack.)

UPI
PASCAL
ORTRAN



APL
STOCK
QUOTES

TRS-80™ Super Version #1

Why limit yourself to Radio Shack® BASIC or spend hundreds of dollars on new programs and languages?

Through the phone lines, your TRS-80™ becomes a sophisticated and powerful computer. Access new languages, make vital decisions based on stock quote, earn money selling those top notch programs you write.

Two services, MicroNet™ and The Source™ open the world to the 80 user. Pick the group for your needs or both!!

MicroNet	
Hookup	\$9.00
Per hour	\$5.00
The Source	
Hookup	\$100.00
Per hour	\$ 2.75

These charges are billed to your Master Charge or VISA.

Houston Micro Computer Technologies, Inc. offers you three packages to choose from:

Package I (ST80III, Accoustic Modem, RS232C) with:	
MicroNet	\$460.
The Source	\$540.
Both	\$545.

Package II (ST80I, Accoustic Modem, RS232C) with:	
MicroNet	\$400.
The Source	\$480.
Both	\$485.

Package III for Mod II (HMCTERM, Accoustic Modem, Cable)	
MicroNet	\$500.
The Source	\$580.
Both	\$585.

ST-80 I (\$25.00)	ST-80 II (\$85.00)	ST-80 III (\$150.00)	HMCTERM (\$200.00)
Set Serial Board from Keyboard	Dump Memory to Disk	Help Command	Converts TRS-80 Model II to Complete Intelligent Terminal for Processing with Major Mainframes
Auto Line Feed	Allow Lower Case Letters	Auto Answer Auto Originate	
Line Printer on	Transmit Auto Logon	Switch Status	
	Transmit Buffer to Serial: Out Port	Warm Program Restart	
	Serial: Into Memory	Job Log	

To order by phone or for local dealer information call: **713/661-2005**

Texas residents add 6% sales tax • MasterCharge • Visa

HOUSTON MICRO-COMPUTER TECHNOLOGIES, INC.

Home and Business Computer Specialists

5313 BISSONNET • BELLAIRE • TEXAS • 77401 • 713/661-2005

Dealer inquiries invited.

characters would normally be. Most video drivers don't actually send control characters to the video RAM; rather, they decode them and take the appropriate action. For some strange reason, the TRS-80 video driver was changing the normal alphabetic codes to control codes before sending them to the video RAM.

The First Program (in Greek)

I know that some people think that programming computers is like talking in Greek, but this is ridiculous! The Level II manual has a short program in the back which will display all of the graphics characters. I typed the program into my computer... in Greek! I changed it slightly, so it would print all characters not including the control codes. After I finished typing it, I listed it. Since I can't read Greek, I couldn't tell if I had it right or not, but at least the list command worked.

Next I typed "τχο;" that's RUN, for those of you who don't know Greek. Characters flashed by on the screen, and scrolled off before I could read them. I ran it again, but I halted the computer before everything disappeared. The special characters and numerals looked good. Then there were two sets of Greek characters where the uppercase and lowercase should be. Next came the graphics characters, which looked all right.

Fig. 6. Level II TRS-80 memory map. (Reprinted from "Level II BASIC Reference Manual," courtesy Radio Shack.) I have added a few addresses I have discovered.

D/LEVEL II TRS-80 MEMORY MAP		ADDRESS	
DECIMAL	HEXIDECIMAL		
0	0000		
			LEVEL II BASIC ROM
12288	3000		
			RESERVED
14302	37DE		COMMUNICATION STATUS ADDRESS
14303	37DF		COMMUNICATION DATA ADDRESS
14304-7	37E0-3		INTERRUPT LATCH ADDRESS
14304-7	37E0-3		DISK DRIVE SELECT LATCH ADDRESS
14308-11	37E4-7		CASSETTE SELECT LATCH ADDRESS
14312-5	37E8-B		LINE PRINTER ADDRESS
14336	37EC-F		FLOPPY DISK CONTROLLER ADDRESS
	3800		TRS-80 KEYBOARD
			MEMORY
15360	3C00		TRS-80 CRT
			VIDEO MEMORY
16383	3FFF		
16384	4000		LEVEL II BASIC FIXED RAM
			VECTORS (RST'S 1 THROUGH 7)
16402	4012		
16405	4015		KEYBOARD DEVICE CONTROL BLOCK
			DCB + 0 = DCB TYPE + 1 = DRIVER ADDRESS + 2 = DRIVER ADDRESS + 3 = 0 + 4 = 0 + 5 = 0 + 6 = 'K' + 7 = 'I'
16413	401D		VIDEO DISPLAY CONTROL BLOCK
			DCB + 0 = DCB TYPE + 1 = DRIVER ADDRESS (LSB) + 2 = DRIVER ADDRESS (MSB) + 3 = CURSOR POS N (LSB) + 4 = CURSOR POS N (MSB) + 5 = CURSOR CHARACTER

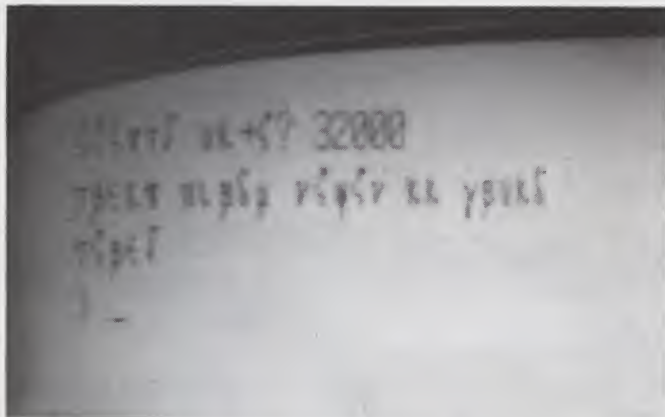


Photo 3. Initial run of Level II BASIC. Translation:
MEMORY SIZE? 32000
RADIO SHACK LEVEL II BASIC
READY
>

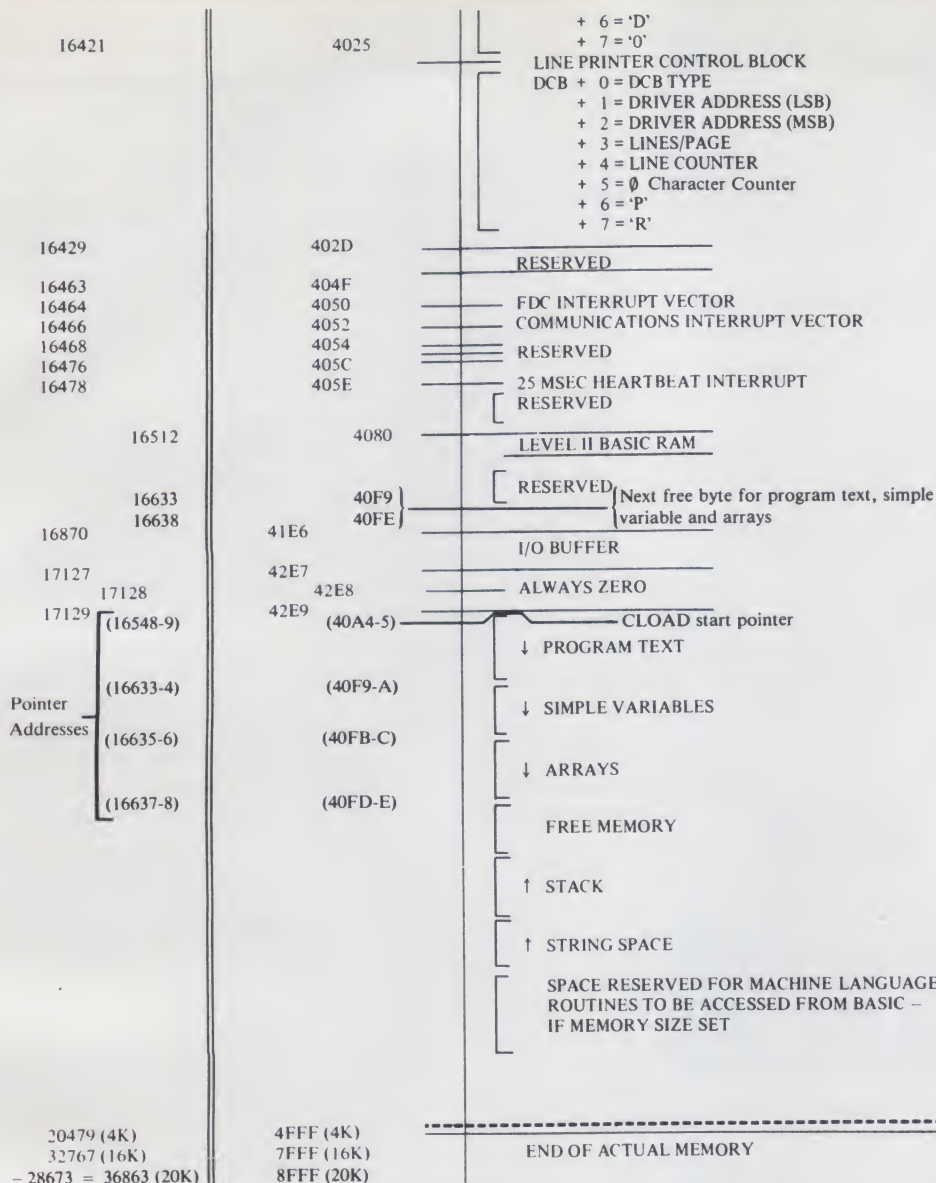
Finally, there were all of those spaces, as everything scrolled off the screen. The Level II manual has a good explanation for the scrolling phenomenon. The codes, C0H to FFH, are space-compression codes for 0-63 spaces. So, by printing all of those codes, I had printed about 2000 spaces to the screen. I changed the program so it did not print the space-compression codes and ran it again. This time it didn't scroll off the screen.

Video Driver Patch

I remembered something I had seen in the Level II manual, which showed a memory map,

which had a detailed description of some of the RAM locations used by the Level II BASIC. I was interested in a short section of 25 RAM locations containing three device control blocks. There were control blocks for the keyboard, the video display and the line printer. As you can see from Fig. 6, among other things, each block contains a driver address.

Now I figured all I had to do was to change the driver address to my own video driver, and I would be in business. I tried it. Nothing! I guessed that they used a different register to transfer the data byte. With this in mind, I set up a breakpoint at



actual lowercase code to the video RAM, it would be printed as a numeral or a special character. So they had to convert lowercase to uppercase. It was probably simpler to convert both upper and lowercase letters to control codes than to just change lowercase to uppercase.

Anyway, as far as they were concerned, that particular bit didn't really matter because it was not even in the RAM! Personally, I think they should have spent the extra buck on one more memory chip, then they could have had both upper and lowercase on the computer.

The final solution I came up with was to duplicate the first dozen instructions of their driver and then skip over the section that screws up the characters and jump back to their driver. The total patch is about 40 bytes.

Listing 3 shows that I have included two more small patches to the driver. The first changes the up-arrow code from 5B (which prints a left bracket[]) to 1C, so it prints an up arrow on my TVT. Radio Shack mentions in the Level II manual that some TRS-80s may print the up-arrow as a left bracket. The second allows me to bypass the space-compression codes and print 64 more of my programmable characters instead. This is accomplished by poking one byte in a memory location.

The Cassette Interface

Having gotten the video driver working made me feel very confident. I was now ready to attack the cassette interface. I placed the Blackjack tape supplied with the Level II kit in the recorder (a Radio Shack CTR-40) and typed CLOAD. I have a small tape controller box, which enables me to hear the data while the computer is reading it. This is convenient because you can tell the difference in the sound of the actual data and the leader tone on the tape.

I turned on the recorder and hit the return key. One nice thing about the TRS-80 cassette driver is that two asterisks flash in the upper-right corner of the screen when the computer is reading data. The asterisks first appear

the entry point of my video driver. I was then able to determine that the data was always in register C; my driver required the data in register A. I patched this in and tried again.

Now I was getting data, but everything was on the same line! There were only carriage returns and no line feeds! It seems the TRS-80 video driver automatically generates a line feed when it gets a carriage return. As it turns out, my video driver generates a carriage return if it gets a line feed! So I checked for carriage returns and converted them to the line feeds and tried again.

Now that was much better!

Everything seemed to work. Well... almost everything. The clear screen function did not work. I know this used to work when everything was in Greek. Referring again to the Level II manual, I noticed they have a table that describes all of the control codes that are implemented (Table 1).

I had two choices: modify my video driver to handle all of the control codes or try to see if I could patch their video driver so it would work. Half out of curiosity as to what they were doing and why it worked (on a TRS-80) and half because I didn't really feel like rewriting my driver, I disassembled their driver.

As I had guessed earlier, they are converting both upper and lowercase letters to control codes. The question is, "Why do they do this and how come it works?" The answer is in the hardware manual. It seems they thought it would be less expensive to use only seven bits of information in the video RAM instead of eight. They use one bit to select graphics characters or regular characters. That leaves six bits for the ASCII code.

But the ASCII code is a seven-bit code; how can that work? They cheat a little. The seventh ASCII bit is generated with a NOR gate from two other bits. This means that if they sent an

SAVE ON ADD-ONS FOR APPLE® AND TRS-80®

NEWDOS/80

Powerful Disk Operating System for the TRS-80® designed for the sophisticated user and professional programmer. NEWDOS/80 is not meant to replace the present version of NEWDOS 2.1 which satisfies most users, but is a carefully planned upward enhancement.

- New BASIC Commands with variable record lengths up to 4095.
- Mix or match drives 35, 40, 77, 80TK.
- Security boot-up for BASIC or machine code application programs.
- Improved editing commands.
- Enhanced RENUMBER that allows relocation.
- Device handling for routing to display and printer simultaneously.
- CDE function: striking of C, D, and E keys allows user to enter a mini-DOS.
- Compatible with NEWDOS and TRSDOS 2.3.
- Superzap 3.0 and 2.1 utilities.

NEW DOS FOR APPLE® "APEX"

The complete APEX package with operating system, assembler, editor and user manuals. The package also includes a complete set of utilities to maintain files on single or multiple drive systems. (Specify 5 inch Apple disk or 8 inch disk.)

\$99

RELATED SOFTWARE

XPLO \$79
FOCAL™ \$59

SAVE ON APPLE II 16K
FREE MTI MEMORY UPGRADE KIT TO 48K
WITH PURCHASE OF APPLE II 16K

(MTI ONLY) **\$1195**



16K RAM MEMORY KIT \$69

DISK DRIVE SALE!

\$70 worth of FREE merchandise with purchase of Shugart SA400 with power supply and chassis. The disk that Radio Shack sells for \$499.

SAVE \$200 \$369
TF-1 Pettec FD200, 40 track ... \$389
TF-5 MPI B51, 40 track \$389
TF-70 Micropolis, 77 track \$639
TDH-1 Dual sided, 35 track \$499
MAX Disk 2: 10 Megabyte ... \$4995

TRS-80® SOFTWARE

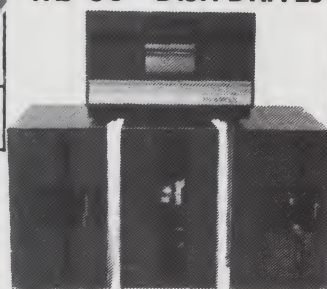
NEW DOS+ 35 track \$99
AJA Word Processor \$89
AJA Business Program \$289
Disk Drive Alignment Program ... \$109
Radix Data Base Program \$99.95

MOD I "8" DISK SYSTEM

- One SA800R DOS and Cable
- 2 Drive Chassis and Power Supply

\$1095

TRS-80® DISK DRIVES



DISK DRIVE SYSTEM

- 2 Shugart SA400 with power/chassis
- Cable
- Interface 32K
- 1 35-Track DOS+

\$1199

SPECIAL PRICE ONLY

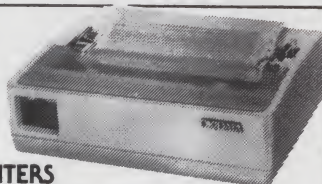
★BARE DRIVES FOR ANY MICROCOMPUTER★

Pettec FD200 \$282
Shugart SA400 \$279
MPI B52 \$349
FD250 \$359
SA800 \$479
B51 \$279

*Registered trade mark of Radio Shack and Apple

OKIDATA PRINTER

LIST \$1009
OUR PRICE **\$699**



PRINTERS

Centronics 779 \$1069
Centronics 737 \$939
Centronics 701-1 \$1795
Spinwriter-NEC \$2549
Base 2 Printer 80, 132 col. graphics/tracators \$599
ANADIX 700-1 \$925
702-2 \$1195
\$1995

MTI MICROCOMPUTER TECHNOLOGY INCORPORATED

3304 W. MacArthur
Santa Ana, CA 92704
(714) 979-9923

Telex #678401TABIRIN

ALL PRICES CASH DISCOUNTED • FREIGHT FOB FACTORY

ASK FOR FREE CATALOGUE

Aparat, Inc.

7310 E. Princeton Ave.
Denver, CO 80237
(303) 741-1778

when the actual data on the tape starts, just after the leader tone ends. They then flash as each line of program is read.

Somewhat to my surprise, the asterisks appeared and began flashing as soon as the leader tone ended. As soon as the data ended, the computer typed READY. I typed RUN. The program started executing! It asked me several questions, including my name.

After my second or third response, the program bombed. Oh well, I knew it was too good to be true. I adjusted the volume on the recorder and tried again. After several repeats of the above, the program actually ran all the way through. Ah, success at last. Next, I tried making a tape. I had to adjust the volume several times to get it to read back correctly, but this also worked.

The volume setting on the tape recorder is critical. I usually have to adjust it several times before I can get a program to

load correctly.

I bought the Library 100 from The Bottom Shelf, Inc. This is a five-cassette package of 100 assorted programs for the TRS-80. I have to adjust the volume several times even to read programs on the same cassette. According to the hardware manual, the data on the cassette is saved with a checksum. This is useful for detecting load errors.

The only problem is that the Level II cassette loader program does not check the checksum and tell you when a bad load has occurred. My own cassette loader does this, and while I don't have frequent errors, it sure is nice to know that the load is bad before you try to execute the program.

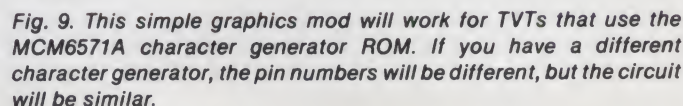
I have discovered several ways to help determine if a load is good or not. The load will be bad if the asterisks appear before or after the point on the tape where the data actually starts; if the data stops and the

Code	Hex	Function
0-7	00-07	None
8	08	Backspaces and erases current character
9	09	None
10-13	0A-0D	Carriage returns
14	0E	Turns on cursor
15	0F	Turns off cursor
16-22	10-16	None
23	17	Converts to 32 character mode
24	18	Backspace ← Cursor
25	19	Advance → Cursor
26	1A	Downward ↓ linefeed
27	1B	Upward ↑ linefeed
28	1C	Home, return cursor to display position(0,0)
29	1D	Move cursor to beginning of line
30	1E	Erases to the end of the line
31	1F	Clear to the end of the frame

Table 1. Control codes decoded by the video driver on the Level II BASIC ROMs. (Reprinted from "Level II BASIC Reference Manual," courtesy Radio Shack.) I have added hex codes.

Listing 4. Keyboard driver replaces the one on the Level II ROM. It works in conjunction with my normal keyboard interrupt routine in Listing 1. The printer patch replaces the Level II printer driver.

The only way to get the pro-



gram's attention is with an interrupt. If you have an interrupt-driven keyboard, you could use a program such as Listing 1 to simulate the TRS-80 memory-mapped keyboard, as I did at first. Otherwise, you need some other means of interrupting the computer. This could be as simple as a switch to the interrupt line on the Z-80. The interrupt service routine could simply change the keyboard driver address and then return to the Level II program.

There are only two situations where you could get by without any interrupts. If you actually connect your keyboard the same way as Radio Shack did, you wouldn't need interrupts. If you already have a keyboard connected some other way, re-wiring it is probably undesirable. Or, if you have a hardware front panel, you could interrupt the computer that way and change the keyboard driver address. While that is not really very difficult, it is kind of a bother to flip all those switches. My system includes a front panel, and I didn't want to do it that way.

The method I used to interrupt the computer is a bit unusual for a microprocessor. I have a circuit in my computer that generates an interrupt if the computer attempts to read a memory address at which there is no memory installed (see Fig. 8). This interrupt saves all the registers, prints a "No Memory"

message and jumps to my monitor. When the ROM tries to read the keyboard, this interrupt is generated because I don't have any memory there. From here I simply type BC, a monitor command that stands for BASIC Continue.

Listing 2 is the program. Its function is very simple—it merely sets up the new driver addresses for the keyboard, TVT and the printer. Then it restores all the registers and returns to where it was interrupted.

TVT Specifics

If your TVT is a memory-mapped device with 16 lines of 64 characters, you should have no problems getting it to work with Level II BASIC. You will have to change its address to 3C00-3FFF. If you don't have a programmable character generator, you will have to modify the TVT to implement the TRS-80 graphics. The modification should consist of only three ICs as shown in Fig. 9.

Fig. 10 shows the graphics-character format. As you can see, each character cell is divided into six blocks. Each block is controlled by one bit in the video memory. The most significant bit determines if a particular character is a graphics character or a regular character. The multiplexers simply steer the bits to the appropriate positions.

This circuit will work for TVTs, which have a character cell con-



Fig. 10. Scale drawing of one character cell shows that each graphics dot is approximately twice as tall as it is wide. The video RAM bits that control each graphics dot are also shown. This format matches the circuit in Fig. 9.

PROFESSIONAL B/W MONITORS

Designed for industry... priced for the home.



video 100 The video 100 computer monitors are ideal for all your personal and business needs. These highly reliable 12" black and white monitors feature a 12 MHz band width and 80 character by 24 line display. Plug-in compatibility with Apple, Atari, Radio Shack, O.S.I., Micro-Term and Exidy make these the perfect text display for almost any system.

UNDER \$160.00



video 100-80 The model 80 features an industrial grade metal cabinet with built-in disk mounting capability and space for an 11" x 14" PC board for custom designed electronics.

The solid state circuitry assures a sharp, stable, and trouble-free picture. The front panel controls include power, contrast, horizontal hold, vertical hold, and brightness. Adjustments for size, video level, and width are located on the rear panel.

UNDER \$200.00

VIDEO 100 AND VIDEO 100-80 SPECIFICATIONS

- 12" diagonal measure display
- Video band width 12 MHz ± 3 DB
- 80 character by 24 line display
- Video 100-80 provides mounting space for mini floppy disk.
- Resolution—Over 700 lines at center horizontally—over 350 lines at center vertically.
- Convenient front panel controls
- Input impedance 75 Ohms
- 90% deflection picture tube display

✓ 59

LEEDEX CORPORATION

2420-E Oakton St • Arlington Heights, Illinois 60005 • (312) 364-1180 • TLX: 25-4786

Dealer discount available

sisting of 12 lines of eight dots. If your TVT has 12 lines of six dots, simply tie the two outputs from mux A to each of three inputs on mux B instead of the four shown. If your TVT has a different arrangement of lines and dots, you have several choices.

First, you could stretch or shrink some of the graphics dots so they fill the available lines and dots in the character cell. This may cause some graphics dots to be different sizes than other ones if the total number of lines and dots are not evenly divisible by three and two, respectively.

Second, you could modify your TVT so it has a line count divisible by three and a dot count divisible by two. This is a bit tricky and should be attempted only after you have examined the schematic and understand the timing details of the TVT. The first mod is simpler and doesn't affect the timing, but you should still closely examine the schematic of your TVT before attempting to install the change.

Third, you could forget about the graphics. This is the simplest solution, but since a lot of game programs use the graphics, you may not want to do this. If you never play games, then you don't need the graphics anyway.

I suggest you try the first solution before trying the second. The slightly different size dots will go unnoticed in many applications anyway. My own TVT has a software-selectable character cell size. I can select 13 by 9 or 12 by 8. I normally operate in

the 13 by 9 mode and have found it satisfactory in many graphics applications.

If your video terminal is a completely separate unit from your computer, you obviously don't have a memory-mapped device. This means you can't use any part of the TRS-80 video driver. You will have to either write your own or modify the one you are presently using. The most important thing is to have the control characters respond correctly (see Table 1).

There are a few features in Level II BASIC that won't work with this type of setup. The graphics functions, SET, RESET and POINT, won't work, although you could send the graphics characters to the terminal like any other character. The PRINT@ and POS commands won't work either. Everything else should be fine though.

Your First Run

When you first try to run the Level II BASIC, you may have a different sequence of events than I do, depending on just how your hardware is configured. As you recall, my first run produced Greek characters. I no longer get Greek when I initialize the BASIC ROM. The first thing that appears is a "No Memory" message. This occurs when the ROM attempts to read the keyboard memory. I then type BC (BASIC Continue).

As described earlier, this changes some of the RAM locations just initialized by the ROM and returns to Level II BASIC. From here, my system behaves

just like a TRS-80.

If you don't have a "No Memory" interrupt on your system, and depending on what your TVT does with control characters, your system could produce Greek characters, some strange graphics characters or absolutely nothing. The next display will depend on what you have in the keyboard memory area. If this memory is all zeros, you will only see one line of whatever characters your system is producing. If the memory is all ones (FF hex) or random data, you should see several lines of these characters continuously being written to the TVT and scrolling off the screen.

No matter what you see, you should now hit your interrupt button (control-Z, or whatever) to put you back into monitor. After typing the BASIC Continue command, you should have a blank screen.

The ROM is now waiting for your response to the MEMORY SIZE question, even though you can't see that message. Typing anything should cause it to appear on the screen. Since there may be several unknown characters in the keyboard buffer, you should first delete these with the back-arrow key. When the cursor stops moving back, all characters have been deleted. Now answer the MEMORY SIZE question as you wish. If you hit a carriage return with garbage data, the ROM will ask the MEMORY SIZE question again.

One final note: if, on your system, memory address 37ECH returns anything other

than 00 or FFH when read, the ROM may attempt to boot the disk. I'm not sure exactly what will happen, but it will most likely get hung up and do nothing. If you have no memory at that address, you should be OK, since most systems read FFH or 00 to nonexistent memory.

Conclusions

For someone with a Z-80 microcomputer system who is looking for a good BASIC and would prefer to have it on ROM, Radio Shack's Level II ROM add-on kit for their TRS-80 is a good way to go. The price is reasonable—less than many BASICs that only come on cassette. If you consider the additional cost of EPROMs to put another BASIC on ROM, the Level II BASIC is less expensive than any other I know.

That the TRS-80 is the most popular microcomputer today ensures that there will be more directly compatible software than any one person can use. The ROM also contains a floppy disk bootstrap routine. This allows easy addition of one or more mini-floppy disk drives for a more versatile system. Radio Shack's TRSDOS may not be the best, but at only \$14.95, it certainly is the most inexpensive disk operating system I have ever seen. ■

References

"TRS-80 Microcomputer Technical Reference Handbook," Radio Shack.
"LEVEL II BASIC Reference Manual," Radio Shack.
"TRSDOS & DISK BASIC Reference Manual," Radio Shack.

MOVING?

Let us know 8 weeks in advance so that you won't miss a single issue of *Kilobaud Microcomputing*. Attach old label where indicated and print new address in space provided. Also include your mailing label whenever you write concerning your subscription. It helps us serve you promptly.

- ☐ Address change only
- ☐ Extend subscription
- ☐ Enter new subscription
- ☐ 1 year \$18.00

- ☐ Payment enclosed
- ☐ Bill me later

AFFIX LABEL

If you have no label handy, print OLD address here.

Name _____
Address _____
City _____ State _____ Zip _____

print NEW address here:

Name _____
Address _____
City _____ State _____ Zip _____

Kilobaud Microcomputing P.O. Box 997 • Farmingdale NY 11737

And now the news...



CompuServe announces the availability of international, national and regional news through your personal computer or terminal.

This up-to-the-minute service includes:

- late breaking international and national news, including features and syndicated columns
- national sports with tabular standings and box scores
- national business and financial news, including the latest stock prices and closings
- national broadcast wire
- Washington news wire
- weather updates
- and selected regional wires

Find out how your favorite football team fared or get a full account of the game in seconds. Find out how the market did today or what movies got good reviews. Check election results, key legislative votes, the latest on foreign affairs. Even background stories or predictions for the future. International events. National news. What diplomat is throwing a party in Washington.

All this and more is yours today through CompuServe.

A 300-baud modem is all your personal computer or terminal needs to access all the services available via local phone calls in more than 175 North American cities from 6 PM to 5 AM weekdays, weekends and most holidays. And the basic charge is only \$5.00 an hour, billed in minute increments, to your charge card. Want more information? Write.

MicroNET™

CompuServe

✓ 147

Dept: K
Personal Computing Division
5000 Arlington Centre Blvd.
Columbus, Ohio 43220

64K Memory For the H8

Last month's article continues with construction and checkout of the memory.

Myron J. Seibold
PO Box 5131
Santa Ana, CA 92704

Last month, part 1 described the actual design of a 64K, single card semiconductor memory for the Heathkit H8 computer. Now let's look at its construction and operation.

Power Supply Circuits

The three power supply voltages required by the memory are easily obtained from the H8 computer. The unregulated H8 voltages, -18, +8 and +18, are converted into -5, +5 and +12 volts, respectively, using standard three-terminal voltage regulator chips (see Fig. 1).

The power supply current requirements are small: -5 volts at 10 mA, +5 volts at 1.0 amperes and +12 volts at 150 mA. The +5 volts should be supplied using four regulators driving separate loads, none of which should draw more than 500 mA. The integrated circuits should be split into four groups, each connected to a separate +5 volt power supply regulator. This is done to permit mounting the regulators on a small heat sink. The memory chips will constitute one of these four groups.

The average (dc) currents supplied by the +12 volt and -5 volt regulators are quite small. The peak currents these voltages must supply on the

memory board, however, are large and are many times greater than the dc currents in both cases.

The peak current demand is

supplied by the filter capacitors in the memory chip array. A large amount of distributed capacitance is required for this purpose. You must carefully follow the layout rules for the memory chip array. These currents must be supplied when needed, without inducing spurious signals. During refresh, these currents are drawn by all of the memory chips simultaneously.

Memory Chip Layout Rules

The wiring board layout requirements for dynamic memory chips are exacting. The memory chips themselves must be arranged together in a compact group. All three power supply voltages, as well as ground, should be respectively cross-connected at each memory chip (see Fig. 2). A pair of high-quality ceramic power supply filter capacitors should also be installed with each memory chip.

The memory chip ground connections should form a net with a memory chip at each connected intersection. The same is true for connections to +12 volts and -5 volts. The +5 voltage should be connected in a similar manner, but is not as critical and is used only to provide TTL compatibility. The +5 voltage is not required to retain data in the memory chips.

High-quality ceramic capacitors are essential to filter the

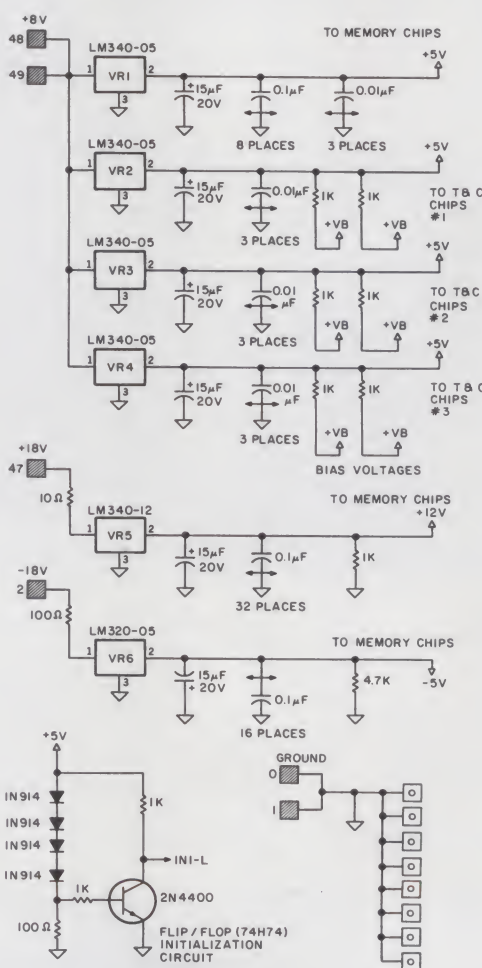


Fig. 1. Power supply circuits.

memory chip power supply voltages. Capacitor quality is directly related to price. Inexpensive capacitors will not work for this purpose. A capacitance of 0.1 μ F should be used for each capacitor. The two capacitors should be located as close to each memory chip as possible. The CK05BX104K capacitor is suitable for this purpose and is recommended for its small size.

The other memory circuits should be laid out in a similar manner, although the layout requirements are not as strict. Only a single power supply voltage is used, and only one filter capacitor need be used for every three or four integrated circuit chips. A good ground structure, however, is always important.

Assembling the Memory Module

This memory was physically assembled in three parts on a retaining backboard identical in size to the printed circuit boards used in the H8 computer (see the memory layout drawing, Fig. 3). The memory chips and their address drivers were easily mounted on a printed circuit board cut from a surplus commercial memory board. I have a limited supply of surplus memory boards of different types from which suitable memory chip arrays may be cut. These printed circuit board pieces typically hold all 32 memory chips, about 70 filter capacitors, four resistor modules (or 32 1/8 Watt resistors) and four integrated circuit address and control driver chips. Using these boards is convenient and ensures that the memory chip array is properly wired and filtered.

The memory chips should be installed on these boards in high-quality sockets. These sockets will facilitate troubleshooting and memory chip replacement. The memory chip array can also be constructed on regular wiring board, such as Vector board, following the layout rules previously given. Again, sockets should be provided for the memory chips.

The remaining circuits were separately wired on a small

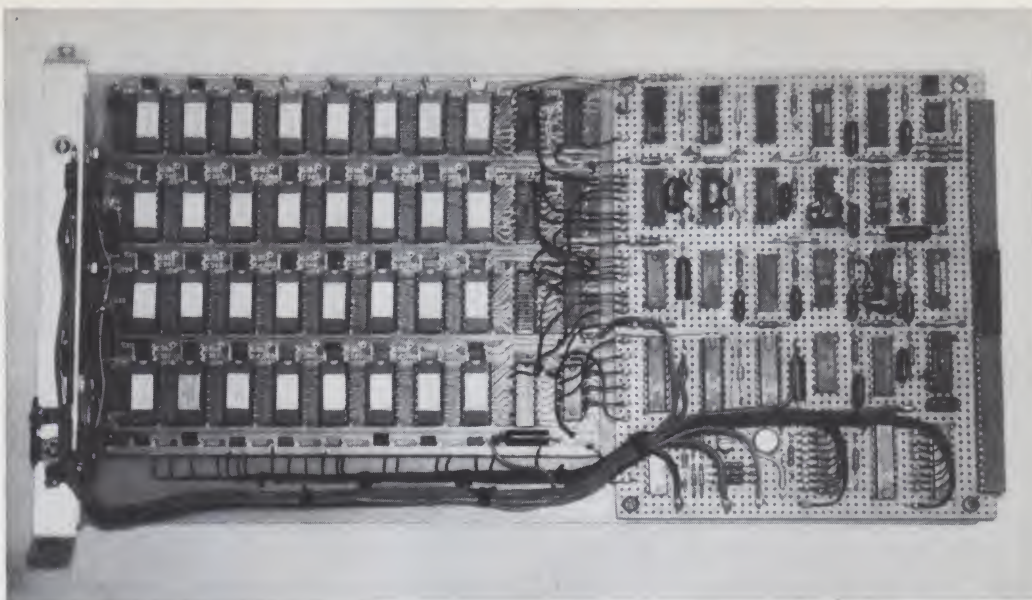


Photo 1. Full view of the memory module. Note light reflected from the array of 32 memory chips. All information is stored in these chips. The memory chips themselves occupy less than one half of the memory module. The remaining space is occupied by the memory chip support circuitry. This is characteristic of most dynamic memory designs.

piece of Vector board. The Vector board hole spacing is 1/10 inch in a square array. Small-size Vector pins are used with this board. Thirty integrated circuits can be laid out in a 6 x 5 chip array with ample space around them for discrete components.

Wire-wrap sockets are recommended for the integrated circuits. These sockets can be glued to the Vector board and the leads cut to a convenient length for wire (solder) connections. Either 1/4 Watt or 1/8 Watt resistors may be used. The timing capacitors normally have a rating of at least 500 volts. Photos 1 and 2 of the memory module may differ slightly from the layout shown in Fig. 3. The layout is small, and component placement is not critical. Wiring connections should always be as short as possible.

Wires must be soldered to the memory chip printed circuit board for connection to the circuits on the Vector board. A few ground wires should always accompany any groups of signal wires. From the bottom of the memory chip array, for example, a bundle of eight data input lines, eight data output lines and four ground lines was brought out (see Photos 1 and 2).

The memory chip array printed circuit board and support circuit Vector board were mounted to the backboard using short standoff spacers. The two boards were then wired together. The voltage regulators were mounted to a standard Heath metal-mounting bail at the edge of the backboard. This bail acts as a heat sink for the voltage regulators. It is a poor heat sink, and four +5 volt regulators were used to reduce the regulator junction temperatures. The bail gets hot and may reach 150 degrees Fahrenheit (65 degrees Celsius).

The single +12 volt regulator can also be mounted on the bail. Silicon grease should be used when mounting the regulator chips. The -5 volt regulator does not get hot and need not be mounted on the heat sink. The bus connectors should be mounted directly on

the Vector board. A pair of standard Heath gold-plated connectors should be used with a tie bar. The connectors should be well secured to the Vector board. Cut-down Vector pins can be used as solder eyelets for this purpose.

The memory can be assembled and operated in smaller versions than 64K. In this case, you can build a complete 64K memory with memory chips installed in only one or two rows of sockets. The memory will work with a single row of eight memory chips. This should not entail much expense and will provide 16K of memory capacity. Memory capacity can then be increased in 16K increments up to 56K by simply installing additional rows of memory chips.

A note of caution: the memory chips are MOS integrated circuits and are susceptible to damage by static electricity.

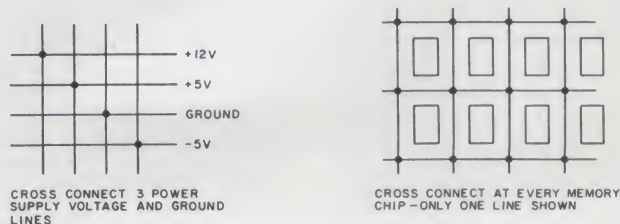


Fig. 2. Memory chip power-ground cross connections.

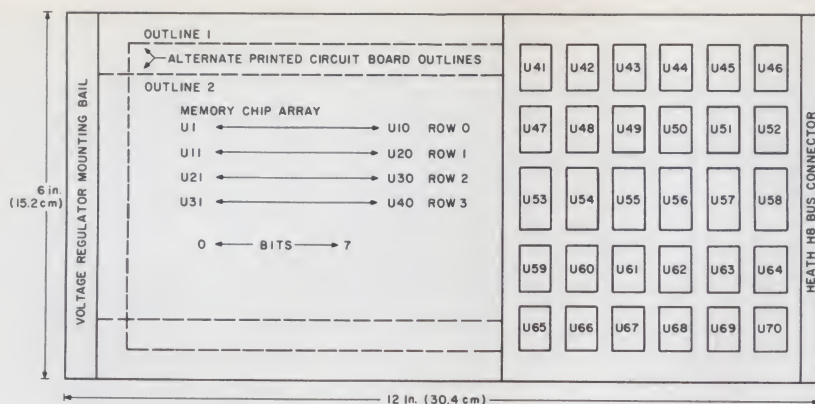


Fig. 3. Memory module layout.

They must be handled carefully, observing the precautions normally taken when using MOS devices. The memory chips must be handled one at a time and should be stored on a conductive foam pad when removed from the memory module.

Operation

When the memory is operating properly, the front panel (monitor program) can be used. It should be possible to load and store information anywhere in the memory address range from 8K to 64K. It is a heady experience loading and retrieving data in the higher address locations for the first time! All the effort in building and debugging the memory now seems worthwhile!

The H8 memory test routine should now be entered and run to ensure that the entire memory is functional and that there are no defective memory chips. The Heath H8 memory test routine is listed on pages 61 and 62 of the H8 operating manual. It is also listed and described in detail on pages 9 through 14 of the operating manual.

To test 56K of memory, the data placed in address location 040 105 (split octal notation) of the test routine should be changed from 057 to 377. This raises the upper memory test limit from 12K to 64K. (The memory test always begins at 8K.) To test smaller amounts of memory, the upper memory limit can be varied accordingly. See page 0-58 of the H8 software reference manual for the high-byte

address boundaries for 4K decimal increments of memory capacity. The high-byte addresses are octal numbers and should be decremented by one (except in the case of 377) to set the memory boundary. For example, 200 - 1 = 177 sets the upper memory boundary at 32K, for a memory capacity of 24K.

The memory test begins at address 040 160, rather than at the 8K boundary of 040 000. Also, the memory test ends at xxx 260, rather than the upper limit of memory at xxx 377. These small amounts are excluded from the test because they are needed to operate the front-panel monitor program, as well as administer the test itself.

If the memory test runs successfully, it can be assumed that these excluded locations are also good. However, these locations can be thoroughly tested by interchanging RAS lines on the memory module. This is easy to do. RAS 0 and RAS 3 are interchanged with RAS 1 and RAS 2, respectively. This physically changes the memory chip rows responding to given address inputs in 16K blocks.

The memory test routine is primarily used to locate defective memory chips and certain kinds of problems in the memory chip array wiring. If there are problems in the memory chip timing and control circuits, the front-panel monitor program will not run.

I have a Heathkit H8 computer, H8-5 interface module, H9 video terminal and a pair of cassette units. The new 64K

memory module works perfectly with this system. It certainly does more than the Heathkit 8K H8-1 static memory module it replaces. The computer can now be filled with interface boards, rather than with memory modules. This should eliminate any future need for a computer expansion chassis.

This memory has also been tested in an H8 computer using the H17 floppy disk system. The memory works perfectly with the floppy disk, and the large capacity of the memory effectively eliminates the need for a second floppy disk drive unit for disk copying. Single drive disk copying proceeds very rapidly when using a large memory.

Troubleshooting the Memory Module

This design is proven. Therefore, you should encounter a minimum number of problems in getting the memory to work—at least with a Heathkit H8 computer. In some cases, what appear to be memory problems may actually be problems in the computer hardware or software. It is now well established that the H8 is somewhat unreliable. The sockets on the voltage regulator leads on every H8 module should be removed, and these leads should be soldered directly to the voltage regulator terminals. It would also be worthwhile to replace the tin-plated motherboard connectors with gold-plated connectors of the same type.

Socket and connector problems occur unpredictably at infrequent intervals. Individual

sockets can be tested by physical manipulation while running a program. Programs should run without interruption while sockets, or printed circuit boards, are flexed or tapped. A vibrator (use an engraving tool with a plastic ball on the point) set at low frequency can be very useful in this case.

Problems can also exist in the computer software. When running Heath cassette BASIC, you must software-set the upper memory limit below 40K. You can use the software configuration option to do this. Alternatively, the RAS-3 line to the last row of memory chips can be lifted and the memory run as a 40K version. The RAS-3 memory chip line should be connected to a +5 volt bias resistor in this case.

Be very careful not to short connector pin 2 and 3 together on the bus when making measurements. This will destroy a number of integrated circuits on several computer modules. When wiring the memory module connector, you should note that the first pin is 0, not 1. If the connector is miswired, -18 volts will be placed on pin 3, with the above-mentioned consequences.

If the front-panel monitor program won't run, there is a problem in the memory chip timing and control circuits. Check all six power supply voltages first (+5 volts from each of the four regulators, +12 volts and -5 volts). An oscilloscope should then be used to check circuit operation. A dual-trace or external sync oscilloscope is required to make differential timing measurements.

Frequently, you can provide signals to the memory interface to check memory circuit operation when the front panel does not operate properly. Repeated pushing of front-panel buttons (especially reset) should set this up. You should first check all timing adjustments wherever possible (see timing specification, Fig. 4, part 1). Then you can check circuit operation for wiring errors and defective parts. It may be helpful to interchange RAS lines between rows of memory chips to

Hundreds of Rolls Royces, Yachts, Airplanes & Premium Properties

FOR SALE IN

THE ROBB REPORT



THE ROBB REPORT, published monthly, is the market place for the buyer, seller and trader who appreciates the finer things in life. Listed for sale are hundreds of new and previously owned antique and classic motor cars, yachts, airplanes, premium properties horses, art, firearms and antique treasures. Complete descriptions and photographs are included, as well as the owner's name, address and telephone number.

A 12 month subscription to THE ROBB REPORT is \$45.00*. Send your check to the address below, or you may charge your subscription to Visa, Master Card, American Express or Diners Club by calling 404-256-9470 and giving your card account number and expiration date.

The Robb Report

THE MAGAZINE FOR CONNOISSEURS

THE ROBB REPORT / P.O. Box 720317 - TF / Atlanta, Georgia 30328

*Add \$30.00 for overseas subscription. Prices subject to change without notice.

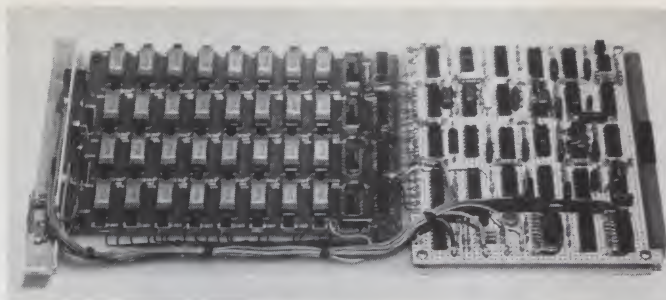


Photo 2. Another view of the memory module. Note use of a backboard to mount the separate memory chip and control circuit boards. A standard H8 bus connector and chassis mounting bail are used. The connector mounts on the control circuit board. The metal bail is mounted on the backboard.

locate or bypass rows with bad chips.

When adapting this design to another computer interface, you may have to devise and perform circuit modification experiments in order to obtain information. This is often necessary to locate problems that cannot be found using the oscilloscope. Interfacing involves both hardware adaptations to the computer bus and possible changes in the memory timing.

If you suspect a memory-read-access-time problem, RDYIN can be asserted for every memory cycle to check this. To accomplish this connect U58-1 to a +5 volt bias resistor or to U58-2. If the memory can be made to work with this modification—but not otherwise—the memory access time may be excessive.

To reduce access time use faster memory chips. The 4116-2 is 50 nanoseconds faster than

the 4116-3 (see Table 1, part 1). Reducing the respective delays for address multiplexing and the assertion of CAS is required to take advantage of the faster memory chips. This should be done if the 4116-2 memory chip is used. Each of these delays can be reduced by one half when using the 4116-2 memory chip.

A memory-access-time problem can be solved, of course, by simply asserting RDYIN for every memory cycle. Using RDYIN with each memory cycle, however, is undesirable, as this will cause the computer to run more slowly. I experienced no problem with access time using the H8 computer with either the 4116-3 or the 4116-4 memory chips. I used the 4116-3 to provide an adjustable margin of reliability.

The refresh cycle must terminate before a computer memory cycle can begin. Access time will be adversely affected if the refresh cycle delays the beginning of a computer memory cycle when refreshing in the

transparent mode. The input at U54-9 must go high before the input at U54-10 goes high to begin a computer memory cycle, in this case. This is ensured by the 1400 nanosecond maximum specification (Fig. 2, part 1).

Once the front panel monitor program is running, you can use the Heath H8 memory test to test the memory chips. This test will locate about 90 percent of all memory chip problems. No memory test can locate *all* memory problems. Dynamic memories are also susceptible to soft (nonrepeatable) errors caused by alpha particle radiation from the memory chip case materials. Fortunately, these errors are usually infrequent. ■

Heathkit H8 owners who would like to build their own memories can purchase printed circuit boards from the author. Fully assembled and kit versions of this memory in several different (depopulated) memory sizes are available.

DR. DALEY presents Software for the PET and the APPLE

Dr. Daley's software is proud to announce the release of a package of our best selling programs.

These programs, regularly retailing for over \$400, have been assembled into a single

package for only \$69.95* Included is our best selling TREK3, CHECKBOOK, and a mailing list, tutorials, games and puzzles for every member of the family. All attractively packaged in an album.

50 PROGRAMS ONLY \$69.95

*Disk version \$10 extra.



Charge your order to
MC/VISA



Your order will be shipped within four business days from receipt.

DR. DALEY, 425 Grove Avenue, Berrien Springs, Michigan 49103

✓34

Phone (616) 471-5514 Sun. thru Thurs., noon to 9 p.m. eastern time.

We have acquired the rights to all TDL software (& hardware). TDL software has long had the reputation of being the best in the industry. Computer Design Labs will continue to maintain, evolve and add to this superior line of quality software.

— Carl Galletti and Roger Amidon, owners.

Software with Manual/Manual Alone

All of the software below is available on any of the following media for operation with a Z80 CPU using the CP/M* or similar type disk operating system (such as our own TPM*).

for TRS-80* CP/M (Model I or II)
 for 8" CP/M (soft sector single density)
 for 5¼" CP/M (soft sector single density)
 for 5¼" North Star CP/M (single density)
 for 5¼" North Star CP/M (double density)

BASIC I

A powerful and fast Z80 Basic interpreter with EDIT, RENUMBER, TRACE, PRINT USING, assembly language subroutine CALL, LOADGO for "chaining", COPY to move text, EXCHANGE, KILL, LINE INPUT, error intercept, sequential file handling in both ASCII and binary formats, and much, much more. It runs in a little over 12 K. An excellent choice for games since the precision was limited to 7 digits in order to make it one of the fastest around. \$49.95/\$15.

BASIC II

Basic I but with 12 digit precision to make its power available to the business world with only a slight sacrifice in speed. Still runs faster than most other Basics (even those with much less precision). \$99.95/\$15.

BUSINESS BASIC

The most powerful Basic for business applications. It adds to Basic II with random or sequential disk files in either fixed or variable record lengths, simultaneous access to multiple disk files, PRIVACY command to prohibit user access to source code, global editing, added math functions, and disk file maintenance capability without leaving Basic (list, rename, or delete). \$179.95/\$25.

ZEDIT

A character oriented text editor with 26 commands and "macro" capability for stringing multiple commands together. Included are a complete array of character move, add, delete, and display function. \$49.95/\$15.

ZTEL

Z80 Text Editing Language - Not just a text editor. Actually a language which allows you to edit text and also write, save, and recall programs which manipulate text. Commands include conditional branching, subroutine calls, iteration, block move, expression evaluation, and much more. Contains 36 value registers and 10 text registers. Be creative! Manipulate text with commands you write using Ztel. \$79.95/\$25.

TOP

A Z80 Text Output Processor which will do text formatting for manuals, documents, and other word processing jobs. Works with any text editor. Does justification, page numbering and headings, spacing, centering, and much more! \$79.95/\$25.

MACRO I

A macro assembler which will generate relocatable or absolute code for the 8080 or Z80 using standard Intel mnemonics plus TDL/Z80 extensions. Functions include 14 conditionals, 16 listing controls, 54 pseudops, 11 arithmetic/logical operations, local and global symbols, chaining files, linking capability with optional linker, and recursive/reiterative macros. This assembler is so powerful you'll think it is doing all the work for you. It actually makes assembly language programming much less of an effort and more creative. \$79.95/\$20.

MACRO II

Expands upon Macro I's linking capability (which is useful but somewhat limited) thereby being able to take full advantage of the optional Linker. Also a time and date function has been added and the listing capability improved. \$99.95/\$25.

LINKER

How many times have you written the same subroutine in each new program? Top notch professional programmers compile a library of these subroutines and use a Linker to tie them together at assembly time. Development time is thus drastically reduced and becomes comparable to writing in a high level language but with all the speed of assembly language. So, get the new CDL Linker and start writing programs in a fraction of the time it took before. Linker is compatible with Macro I & II as well as TDL/Xitan assemblers version 2.0 or later. \$79.95/\$20.

DEBUG I

Many programmers give up on writing in assembly language even though they know their programs would be faster and more powerful. To them assembly language seems difficult to understand and follow, as well as being a nightmare to debug. Well, not with proper tools like Debug I. With Debug I you can easily follow the flow of any Z80 or 8080 program. Trace the program one step at a time or 10 steps or whatever you like. At each step you will be able to see the instruction executed and what it did. If desired, modifications can then be made before continuing. It's all under your control. You can even skip displaying a subroutine call and up to seven breakpoints can be set during execution. Use of Debug I can pay for itself many times over by saving you valuable debugging time. \$79.95/\$20.

DEBUG II

This is an expanded debugger which has all of the features of Debug I plus many more. You can "trap" (i.e. trace a program until a set of register, flag, and/or memory conditions occur). Also, instructions may be entered and executed immediately. This makes it easy to learn new instructions by examining registers/memory before and after. And a RADIX function allows changing between ASCII, binary, decimal, hex, octal, signed decimal, or split octal. All these features and more add up to give you a very powerful development tool. Both Debug I and II must run on a Z80 but will debug both Z80 and 8080 code. \$99.95/\$20.

ZAPPLE

A Z80 executive and debug monitor. Capable of search, ASCII put and display, read and write to I/O ports, hex math, breakpoint, execute, move, fill, display, read and write in Intel or binary format tape, and more! on disk

APPLE

8080 version of Zapple

NEW! TPM now available for TRS-80 Model II!

TPM*

A NEW Z80 disk operation system! This is not CP/M*. It's better! You can still run any program which runs with CP/M* but unlike CP/M* this operating system was written specifically for the Z80* and takes full advantage of its extra powerful instruction set. In other words its not warmed over 8080 code! Available for TRS-80* (Model I or II), Tarbell, Xitan DDDC, SD Sales "VERSA-FLOPPY", North Star (SD&DD), and Digital (Micro) Systems. \$79.95/\$25.

SYSTEM MONITOR BOARD (SMB II)

A complete I/O board for S-100 systems. 2 serial ports, 2 parallel ports, 1200/2400 baud cassette tape interface, sockets for 2K of RAM, 3-2708/2716 EPROM's or ROM, jump on reset circuitry. Bare board \$49.95/\$20.

ROM FOR SMB II

2KX8 masked ROM of Zapple monitor. Includes source listing \$34.95/\$15.

PAYROLL (source code only)

The Osborne package. Requires C Basic 2.
 5" disks \$124.95 (manual not included)
 8" disks \$ 99.95 (manual not included)
 Manual \$20.00

ACCOUNTS PAYABLE/RECEIVABLE (source code only)

By Osborne. Requires C Basic 2
 5" disks \$124.95 (manual not included)
 8" \$99.95 (manual not included)
 Manual \$20.00

GENERAL LEDGER (source code only)

By Osborne. Requires C Basic 2
 5" disks \$99.95 (manual not included)
 8" disks \$99.95 (manual not included)
 Manual \$20.00

C BASIC 2

Required for Osborne software. \$99.95/\$20.

SYSTEM/6

TPM with utilities, Basic I interpreter, Basic E compiler, Macro I assembler, Debug I debugger, and ZEDIT text editor.

Above purchased separately costs \$339.75

Special introductory offer. Only \$179.75 with coupon!!

\$160.

This Coupon is Worth
One Hundred And Sixty Dollars
Toward The Full Price Of The
SYSTEM/6 Package
System/6 with this coupon is only \$179.95.
This is a limited time offer.

\$160.00

ORDERING INFORMATION

Visa, Master Charge and C.O.D. O.K. To order call or write with the following information.

1. Name of Product (e.g. Macro I)
2. Media (e.g. 8" CP/M)
3. Price and method of payment (e.g. C.O.D.) include credit card info. if applicable.
4. Name, Address and Phone number.
5. For TPM orders only: Indicate if for TRS-80, Tarbell, Xitan DDDC, SD Sales (5¼" or 8"). ICOM (5¼" or 8"), North Star (single or double density) or Digital (Micro) Systems.
6. N.J. residents add 5% sales tax.

Manual cost applicable against price of subsequent software purchase in any item except for the Osborne software.

For information and tech queries call 609-599-2146

For phone orders ONLY call toll free 1-800-327-9191 Ext. 676
 (Except Florida)

OEMS

Many CDL products are available for licensing to OEMs. Write to Carl Galletti with your requirements.

- * Z80 is a trademark of Zilog
 - * TRS-80 is a trademark for Radio Shack
 - * TPM is a trademark of Computer Design Labs. It is not CP/M*
 - * CP/M is a trademark of Digital Research
- Prices and specifications subject to change without notice.

DEALER INQUIRIES INVITED.

**COMPUTER
DESIGN
LABS**

342 Columbus Avenue
 Trenton, N.J. 08629

SURPLUS "SELECTRIC" SPECIAL!

"SELECTRIC" TYPEWRITER TERMINAL

Just imagine; an IBM Model 725 "SELECTRIC" typewriter built into a complete table-top RS-232 terminal! These surplus terminals were formerly on lease and appear to be in good condition (we test 'em to make sure the printer is functional!) These fantastic BCD-Coded terminals feature:

- 15" CARRIAGE
- 725 'SELECTRIC'
- RS-232 I/O
- 132 COLUMNS
- Sim. to IBM 2741
- Std. Typewriter Kbd.
- MAX: 15 CPS RATE
- 10 Chars./Inch
- Removeable Type Sphere
- 134.5 BAUD I/O
- 88 Character Set
- 6 Bit BCD CODE
- Attractive Case
- Upper/Lower SHIFT

ONLY

\$469⁰⁰!
Ea.



While we will check out each unit, we MUST offer these unique bargains "AS-IS": Meaning they may need some service but are basically operational. Add \$20.00 for packing crate, you pay shipping on delivery.

ALSO INCLUDES: Type ball, I/O circuit boards, power supply & some data. Sorry, no power cord included.

—SPECIAL OFFER!!—

Buy 2, take 20% Off the Full Price—
You Pay Only

2 for \$750⁰⁰

"SELECTRIC" PRINTER MAINTAINANCE MANUAL

JUST IN!! We now have available some excellent printer maintenance manuals. These are the most thorough manuals we've seen. Well worth the price! ONLY **\$25.00⁰⁰**.
* "SELECTRIC" is an IBM Trademark

✓ 110



CFR Associates, Inc.

MAIL ADDRESS:
P.O. Box 144
NEWTON, N.H. 03858

WAREHOUSE:
18 GRANITE STREET
HAVERHILL, MASS. 01830

(617) 372-8536
Phone Orders
Are Welcome

WP-6502

a very fine word processor



for **OHIO SCIENTIFIC**

Tape (C1,C2,C4)\$75
5" Disk (C1,C2,C4) ...\$75
8" Disk for 65D\$75

8" 65D & 65U \$125
Descriptive
Brochure **FREE**



Dwo Quong Fok Lok Sow
Box 4196, Grand Central Station
New York City, N.Y. 10163
(212) 685-2188 ✓ 87



Here's a better way to create/edit your North Star basic programs

N★BUS has a unique interactive **GLOBAL LINE EDITOR**, with powerful source preparation/editing features, unmatched anywhere at **ANY PRICE!**

- ✓ Interfaces with ANY release 4 or later BASIC by RUNNING a supplied program.
- ✓ Co-resident with BASIC — merely type the command "EDIT" without a line number.
- ✓ All N★BUS programs are assembly language fast!

Line scrolling plus these exciting commands:
EDIT MODE • INPUT MODE • BOTTOM • TOP • BASIC • BYE • APPEND • NEXT • PRINT • COPY (lines) • DELETE (lines) • SCALE • PROMPT • CHANGE • CHANGE (global) • ERASE COLUMNS • LOCATE • LOCATE (global) • TAB • TCHAR • WINDOW • WINDOW NEXT • WINDOW PREVIOUS • VIEW • INSERT • GO (to a line) • MOVE (lines) • DEVICE

N★BUS ALSO includes **BPRT**, a program print/variable cross-reference utility featuring an ultra-fast shell-Metzner sort, **BPAK**, a source program packer and **RE**, a file rename program. IF YOU USE NORTH STAR BASIC, you owe it to yourself to **ORDER YOUR COPY OF N★BUS today!**

AND ONLY **\$69**

— plus \$1.50 postage

64 pg. manual, alone, \$9.75 ppd.

(Creditable toward system purchase)

Calif. Res. add 6% tax. No C.O.D.'s please. Send check or M.O. VISA or MASTER CHARGE accepted.

Dealer inquiries invited

COMPLETE BROCHURE AVAILABLE ✓ 348



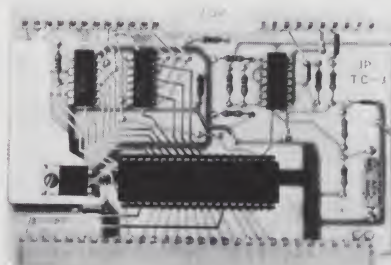
Software Systems

1269 Rubio Vista Rd. • Altadena, Ca. 91001

JPC PRODUCTS FOR

6800

COMPUTERS



High Performance Cassette Interface

- **FAST** - 4800 Baud Loads 4K in 8 Seconds!
- **RELIABLE** - Error Rate Less Than 1 in 10⁶ Bytes.
- **CONVENIENT** - Plugs Directly Into The **SWTPC**.
- **PLUS** - A Fully Buffered 8 Bit Output Port Provided.
- **LOW COST** - \$59.95 For Complete Kit.

- **OPTIONAL** - CFM/3 File Manager.
Manual & Listing \$19.95
(For Cassette Add) \$ 6.95

TERMS. CASH, MC or VISA. Shipping & Handling \$3.00



Order Phone (505) 294-4623
P.O. Box 5615
Albuquerque, N.M. 87185

Precision Engineered Drives...

Power supply guaranteed for one year.

More Capacitance: Insures stable operation over greater line voltage variations (105-125 Vac.)

Scratch resistant steel cover: Primed and baked enamel finish. Virtually eliminates video interference. Color compatible with Radio Shack or Zenith Z89.

Increased ventilation for additional cooling: Top, side and bottom vents mean lower operating temperatures for longer life.

Switch designed with high current ratings (10 AMP).

Transformer designed as integral part of system for best line regulation. Not separately encased to avoid heat build-up providing longer life.

Designed to UL specifications. Wide operating temperature range (0°C to 50°C) Tested to 1500 volts input to output isolation for enhanced power surge protection.

Easy access to terminating resistor for easy field conversion from drive 0 to drive 1, 2, or 3.

Simpler, more reliable circuitry.

Extender: Easy plug-in access

3-wire grounded line cord for added operator safety.

With the number of disk drives on the market increasing, more and more people are beginning to ask what's underneath that cover.

The CCI™ series of disk drives have been designed for long life and ease of operation. The features shown above are what set our CCI drives apart from the rest. With a CCI drive you get an integrated professional design!

If you're still not convinced that you get the most for your money with a CCI drive, just ask for our complete specifications sheet. Then, compare our disk drives to anyone else's.

5 1/4" DRIVES

CCI-100 40 Track (102K Bytes) for TRS-80* Model I \$399.00
CCI-189 40 Track (102K Bytes) for Zenith Z89 \$499.00
CCI-200 77 Track (197K Bytes) for TRS-80* Model I \$675.00

8" DRIVES

CCI-800 77 Track (1/2 Meg Bytes) for TRS-80* Model II \$895.00

All CCI drives are also available for 220 Vac (50Hz) operation.

Operating Systems

NEWDOS Plus for 5 1/4", 40 and 77 Track Drives—with over 200 modifications and corrections to TRSDOS \$110.00
CP/M for Model I, Zenith \$150.00
CP/M for Model II, Altos \$250.00

Software by S&M Systems

INSEQ-80™—Indexed Sequential Access Method (ISAM) for the TRS-80 Model I.

Four machine language programs that can be called from your BASIC program via USR functions to access records either sequentially or randomly. The INSEQ-80 programs maintain all indexes and chains for you. Includes reorganization utility to consolidate files. \$49.95

Professional Business Software using INSEQ-80 for the TRS-80* Model I and Zenith Z89.

Accounts Payable, Accounts Receivable, General Ledger, Payroll per package \$99.00
Inventory per package \$125.00

ComputerCity™

175 Main Street, Dept. 8K, Charlestown, MA 02129 ✓ 278
Hours: 10AM-6PM (EST) Mon.-Fri. (Sat. till 5).

TO ORDER CALL
TOLL FREE 1-800-343-6522
TWX: 710-248-1796

Massachusetts residents call 617/242-3350
For detailed technical information, call 617/242-3350.
Freight Collect, F.O.B. Charlestown.

*TRS-80 is a trademark of the Tandy Corporation

Products also available from: Radio Shack, NEC, Centronics, Paper Tiger, TI, Altos, MPI, Zenith, Mattell, ATARI, PET, OKIDATA, Apple, Eaton/LRC.

FRANCHISE AND DEALER (NATIONAL/INTERNATIONAL) INQUIRIES INVITED

Retail Stores: MA: Burlington, Charlestown, Framingham, Hanover **NH:** Manchester **RI:** Providence



On Time and Space

North Star users can save memory and run time with this program.

The purposes of this article are to present a program I wrote to help reduce the size of North Star BASIC programs, and to describe a software product that not only saves space but reduces run times of almost any North Star BASIC program. (The North Star floating-point board allows use of a slightly smaller interpreter and, in my experience, improves *calculation* times, but for many it is an unaffordable luxury.)

One way to reduce program size is to remove all blanks from a program. A program to do this is on the NSSE Disk 2. You can save additional space by removing remarks, although this may not be desirable.

CHANGE

Two-character variable names use one more byte at each occurrence than do one-character names. I wrote the program CHANGE (Listing 1) to convert two-character to one-character variable names in North Star BASIC. It uses as data a BASIC program on file. The program requests the file name and then information about the variable names to be changed.

In Segment A, any number of variables may be altered. A two-character variable name may be altered to a single character variable plus a blank. In addition, one-character names may be changed to other one-character names.

Since North Star BASIC allows variable names consisting of only one letter and, optionally, one integer, conversion of programs from another BASIC sometimes requires the

Listing 1. CHANGE, a program that allows variable name changes and compaction in North Star BASIC programs.

```

10 GOTO 910
20 READ#0,&K,&N1,&N2\REM READ NO CHARS AND STATEMENT NO
30 WRITE#1,&K,&N1,&N2,NOENDMARK
40 LET K1=K\LET A=0\LET A1=0
50 IF K=1 THEN 830
60 LET F=0
70 N8=N2*256+N1
80 FOR I=1 TO K-3\REM READ LINE
90 READ#0,&A9(I)
100 NEXT I
110 IF O=2 THEN 580
120 REM .....SEGMENT A
130 L5=0\L3=0
140 FOR J=1 TO N9
150 A1=0\A=0
160 Q=-1\R=0\REM REMARK AND "QUOTE" FLAG
170 L5=L(J)+L3
180 V$="\V$=SS(L3+1,L5)\L4=LEN(V$)
190 W$="\W$=TS(L3+1,L5)\L3=L5
200 FOR M=1 TOL4\REM SET UP FOR NAME LENGTH
210 V(M)=ASC(V$(M,M))
220 W(M)=ASC(W$(M,M))
230 NEXT M
240 FOR I=1 TO K-3
250 A2=A1\A1=A\REM SAVE PREVIOUS READS
260 A=A9(I)
270 I1=I
280 IF A9(I)=143 THEN R=1\REM REM
290 IF A9(I)=92 THEN R=0\REM SLASH
300 IF A9(I)=34 AND R=0 THEN Q=-Q\REM QUOTE
310 IF Q=1 OR R=1 THEN NEXT I\REM INSIDE REM OR QUOTE
320 IF A1=154 OR A2=154 OR A1=150 THEN NEXT I\REM SKIP LINE NOS
330 IF A9(I)=38 THEN NEXT I\REM LOOK FOR BYTE ACCESS
340 FOR L=1 TO L4
350 IF A9(I)=V(L) AND Q=-1 AND R=0 THEN 400
360 IF A9(I)=92 THEN R=0\REM SLASH
370 IF A9(I)=143 THEN R=1\REM REM
380 EXIT 530
390 IF A9(I)=34 THEN Q=-Q\REM QUOTE
400 I=I+1
410 NEXT L
420 I=I-1
430 IF A9(I+1)=44 OR A9(I+1)= 41 THEN 460
440 IF A9(I+1)=13 THEN 460
450 IF I<K-4 AND A9(I+1)>32 AND A9(I+1)<91 THEN 530
460 FOR L=1 TO L4
470 A9(I1-1+L)=W(L)
480 NEXT L
490 IF F=0 THEN !
500 IF F=0 THEN !*6I,N8,TAB(15),
510 F=1
520 !W$," ",
530 IF I1>K-3 OR I>K-3 THEN 550
540 NEXT I
550 NEXT J
560 IF O=1 THEN 750
570 REM .....SEGMENT B
580 I1=0
590 Q=-1\R=0\REM REMARK AND "QUOTE" FLAG
600 FOR I=1 TO K-3
610 A2=A1\A1=A\REM SAVE PREV
620 A=A9(I)\REM GET CHARACTER
630 IF A1=154 OR A2=154 THEN 660\REM IGNORE STATEMENT NUMBERS
640 IF A =32 AND Q=-1 AND R=0 THEN 730\REM SKIP BLANK
650 IF A =128 AND Q=-1 AND R=0 THEN 730\REM SKIP LET
660 IF A<>92 THEN 680
670 Q=-1\R=0\REM NEW STATEMENT ENCOUNTERED
680 IF A=143 THEN R=1
690 IF A=34 AND R=0 THEN Q=-Q
700 I1=I1+1
710 A9(I1)=A

```



```

720 GOTO 740
730 K1=K1-1
740 NEXT I
750 FOR I=1 TO K1-3
760 WRITE#1,&A9(I),NOENDMARK
770 NEXT I
780 K9=K9+K-K1\REM NO CHARS REMOVED
790 IF K<>K1 THEN WRITE#1&Z,&K1,NOENDMARK\REM CORRECT CHAR COUNT IF NECESSARY
800 Z=Z+K1\READ#1&Z-1,&A\REM BRING POINTER UP
810 IF O=2 THEN 20
820 GOTO 20
830 !
840 IF O>1 THEN !K9," CHARACTERS REMOVED"
850 CLOSE#1\CLOSE#2
860 !\!
870 !" FINISHED"
880 !\!\!
890 END
900 REM .....SEGMENT C
910 !" PROGRAM TO CHANGE VARIABLE NAMES "
920 !" IN NORTH STAR BASIC PROGRAMS (RELEASE 4) "
930 !
940 !" WRITTEN BY DR. D.J.YATES"
950 !" BOTANY DEPARTMENT"
960 !" UNIVERSITY OF QUEENSLAND"
970 !" ST. LUCIA,4067"
980 !" QUEENSLAND,"
990 !" AUSTRALIA."
1000 !\!\!\!
1010 INPUT" WHAT IS BASIC PROGRAM FILE NAME ? ",A$
1020 !
1030 LET Z=0\p=0
1040 OPEN#0&2,A$
1050 OPEN#1&2,A$
1060 !"YOU MAY: (1) Alter Variable Names"
1070 !" (2) Delete Blanks and `LET`"
1080 !" (3) Perform both (1) and (2)"
1090 INPUT "WHICH OPTION ? ",O
1100 IF O<1 OR O>3 THEN 1090
1110 K9=0
1120 N9=1
1130 IF O=2 THEN 1150
1140 INPUT" HOW MANY VARIABLE NAMES DO YOU WANT TO CHANGE ? ",N9
1150 N5=N9*2\REM DIMENSIONS MUST BE LARGER IF LONGER NAMES ARE REPLACED
1160 DIM A9(255),S$(N5),T$(N5),V(N5),W(N5)
1170 !
1180 IF O=2 THEN 20
1190 S$=""\T$=""
1200 FOR I=1 TO N9
1210 V$=""\W$=""
1220 !" VARIABLE NO ",I," =" ,\INPUT1" ",V$
1230 L(I)=LEN(V$)
1240 S$=S$+V$
1250 INPUT" TO BE REPLACED BY ",W$
1260 IF LEN(W$)<L(I) THEN 1290
1270 !" NAME MUST NOT BE LONGER THAN THAT BEING REPLACED "
1280 GOTO 1250
1290 IF LEN(W$)=L(I) THEN 1320
1300 W$=W$+" "
1310 GOTO 1290
1320 T$=T$+W$
1330 NEXT I
1340 !\!
1350 IF O<>2 THEN!"STATEMENT VARIABLE"
1360 GOTO 20
1370 END

```

```

10 REM PROGRAM TO PRINT THE FIRST N2 FIBONACCI NUMBERS
20 ! "FIBONACCI NUMBERS:"
30 !
40INPUT" HOW MANY NUMBERS DO YOU WANT ? ",N2
50!
60 LET N=0\REM LET INCLUDED FOR TEST OF "CHANGE"
70 LET A9=0
80 !%%10I,A9,\REM PRINT A9
90 LET N=N+1
100 B=1
110 !B,
120 N=N+1
130 C=A9+B
140 !C,
150 N=N+1
160 IF N=N2 THEN 200
170 A9=B
180 B=C
190 GOTO 130
200 !\!
210 ! N2," FIBONACCI NUMBERS HAVE BEEN PRINTED."
220 END
READY

```

Listing 2. FIBON, a program to print Fibonacci numbers.

conversion of two-letter names before a program is run. It is often simpler to enter a "foreign" program "as is" and then alter all occurrences of the "illegal" names at one time. This may be done with CHANGE. A danger in this program is that it will change one variable (B1, for example) to another (B) if instructed to do so. However, the interpreter will not then distinguish between the original occurrences of B and the "new" occurrences, and the program may be ruined.

By requesting the program to change to the same name all occurrences of variable name X or the foreign function LEFT or MID, CHANGE will list all occurrences of the name or function against the line numbers in which they occur, thus simplifying editing. Provided syntax is correct, none of the above changes is made within quotation marks or REM statements.

Segment B of CHANGE is based on the program by L. Steiner on NSSE 2. It allows removal of all blanks that exist after the variable name changes are made. In addition, it removes the nonessential reserved word LET from the pro-

```

PROGRAM TO CHANGE VARIABLE NAMES
IN NORTH STAR BASIC PROGRAMS (RELEASE 4)

WRITTEN BY DR. D.J.YATES
BOTANY DEPARTMENT
UNIVERSITY OF QUEENSLAND
ST. LUCIA,4067
QUEENSLAND,
AUSTRALIA.

```

```

WHAT IS BASIC PROGRAM FILE NAME ?FIBON

YOU MAY: (1) Alter Variable Names
          (2) Delete Blanks and `LET`
          (3) Perform both (1) and (2)

WHICH OPTION ? 3
HOW MANY VARIABLE NAMES DO YOU WANT TO CHANGE ? 3

VARIABLE NO 1 = A9 TO BE REPLACED BY A
VARIABLE NO 2 = N2 TO BE REPLACED BY M
VARIABLE NO 3 = C TO BE REPLACED BY Z

STATEMENT VARIABLE

40 M
70 A
80 A
130 A Z
140 Z
160 M
170 A
180 Z
210 M
39 CHARACTERS REMOVED

```

Listing 3. Output produced by CHANGE in processing FIBON.


```

10REM PROGRAM TO PRINT THE FIRST N2 FIBONACCI NUMBERS
20!"FIBONACCI NUMBERS:"
30!
40INPUT" HOW MANY NUMBERS DO YOU WANT ? ",M
50!
60N=0\REM LET INCLUDED FOR TEST OF "CHANGE"
70A=0
80!##10I,A,\REM PRINT A9
90N=N+1
100B=1
110!B,
120N=N+1
130Z=A+B
140!Z,
150N=N+1
160IFN=MTHEN200
170A=B
180B=Z
190GOTO130
200!\!
210!M," FIBONACCI NUMBERS HAVE BEEN PRINTED."
220END
READY

```

Listing 4. FIBON after being processed by CHANGE.

gram. At the end of processing the program statements, the abbreviated program is written back to the original file. Minor modification allows the output file to be different from the input file. It is also easy to delete the optional GOTO in statements such as IF ... THEN GOTO 123.

Example

Listing 2 is a program, FIBON, in its "raw" state before being processed by

CHANGE. Listing 3 represents the output produced by CHANGE when FIBON is processed. Listing 4 is FIBON after being processed by CHANGE, with the altered names referred to in Listing 3. Note that names N2 and A9 in lines 10 and 80, respectively, are not changed. As indicated in Listing 3, blanks and LETs are deleted to save 39 bytes, about 11 percent of the total for the original program, which

PROGRAM TO CHANGE VARIABLE NAMES IN NORTH STAR BASIC PROGRAMS (RELEASE 4)

WRITTEN BY DR. D.J.YATES
BOTANY DEPARTMENT
UNIVERSITY OF QUEENSLAND
ST. LUCIA, 4067
QUEENSLAND,
AUSTRALIA.

WHAT IS BASIC PROGRAM FILE NAME ?CHANGE

YOU MAY: (1) Alter Variable Names
(2) Delete Blanks and 'LET'
(3) Perform both (1) and (2)

WHICH OPTION ? 3
HOW MANY VARIABLE NAMES DO YOU WANT TO CHANGE ? 3

VARIABLE NO 1 = A9 TO BE REPLACED BY B
VARIABLE NO 2 = K9 TO BE REPLACED BY K9
VARIABLE NO 3 = F TO BE REPLACED BY G

STATEMENT	VARIABLE
60	G
90	B
260	B
280	B
290	B
300	B
330	B
350	B
360	B
370	B
390	B
430	B B
440	B
450	B B
470	B
490	G
500	G
510	G
620	B
710	B
760	B
780	K9 K9
840	K9
1110	K9
1160	B
351	CHARACTERS REMOVED

Listing 5. Output produced by CHANGE in processing itself.

```

490IFG=0THEN!
500IFG=0THEN!%I,N8,TAB(15),
510G=1
520!W$, " ",
530IF I1>K-3ORI>K-3THEN550
540NEXTI
550NEXTJ
560IFO=1THEN750
570REM .....SEGMENT B
580I1=0
590Q=-1\R=0\REM REMARK AND "QUOTE" FLAG
600FORI=1TOK-3
610A2=A1\A1=A\REM SAVE PREV
620A=B(I)\REM GET CHARACTER
630IFA1=154ORA2=154THEN660\REM IGNORE STATEMENT NUMBERS
640IFA=32ANDQ=-1ANDR=0THEN730\REM SKIP BLANK
650IFA=128ANDQ=-1ANDR=0THEN730\REM SKIP LET
660IFA<>92THEN680
670Q=-1\R=0\REM NEW STATEMENT ENCOUNTERED
680IFA=143THENR=1
690IFA=34ANDR=0THENQ=-Q
700I1=I1+1
710B(I1)=A
720GOTO740
730K1=K1-1
740NEXTI
750FORI=1TOK1-3
760WRITE#1,&B(I),NOENDMARK
770NEXTI
780K9=K9+K-K1\REM NO CHARS REMOVED
790IFK<>K1THENWRITE#1%Z,&K1,NOENDMARK\REM CORRECT CHAR COUNT IF NECESSARY
800Z=Z+K1\READ#1%Z-1,&A\REM BRING POINTER UP
810IFO=2THEN20
820GOTO20
830!
840IFO>1THEN!K9," CHARACTERS REMOVED"
850CLOSE#1\CLOSE#2
READY

```

Listing 6. Portion of CHANGE after processing by itself.

did not have excessive blanks, LETs or two-character names. Listing 5 indicates the method of finding all occurrences of the variables K9 and F in CHANGE itself, as well as changing B for A9. You can save a significant number of bytes by using the techniques described. Listing 6 represents a portion of CHANGE after being processed by itself.

Changes and Deletions

On file, and in memory, a North Star BASIC statement is stored as a string of hexadecimal numbers. The first is a character count (N) between 0 and 255. The second two numbers carry the line number. The remaining N-3 numbers are the code representing the rest of the statement. The reserved words are not stored

!	146	DIM	139	OPEN	151
(	224	ELSE	180	OR	237
+	227	END	141	OUT	148
-	229	ERRSET	159	PRINT	130
/	231	EXAM	218	PSIZE	174
<	244	EXIT	150	READ	133
<=	240	EXP	222	REM	143
<>=	241	FILL	149	REN	168
=	245	FN	144	RESTORE	142
>	246	FOR	129	RETURN	138
>=	239	GOSUB	137	RND	206
ABS	219	GOTO	136	RUN	160
AND	236	IF	132	SAVE	170
ASC	182	INP	217	SCR	163
AUTO	164	INPUT	134	SIN	203
CALL	205	LEN	204	SQRT	196
CAT	175	LET	128	STEP	176
CHAIN	155	LINE	156	STOP	140
CHR\$	181	LIST	161	STR\$	184
CLOSE	152	LOAD	165	TAB	179
CONT	166	LOG	221	THEN	178
COS	220	MEMSET	162	TO	177
CREATE	158	NEXT	131	TYP	223
DATA	135	NOENDMARK	185	VAL	183
DEF	145	NOT	247	WRITE	153
DEL	173	NSAVE	169	\	154
DESTROY	157	ON	147	^	225

Table 1. North Star BASIC reserved words and their decimal token requirements.

as their full ASCII representations, but in an abbreviated form in which each is represented by one hexadecimal number. Most of the other alphanumeric characters signifying operators that BASIC recognizes are also stored in a coded form—not their ASCII values but values greater than 127 (See Table 1).

This saves space required to change the program. CHANGE searches for the desired first character in the variable name using its ASCII code. On finding the first character it continues to look for the rest of the name and makes the change when it finds it. If the variable in the original line is longer than the one specified, no change is made. On encountering a quotation mark or REM, CHANGE attempts no changes until after the next quotation or the end of the REM.

In the blank and LET detection routine, when a character is detected in the search, it is deleted, all "characters" are moved along one space, and the character count is reduced by one. The magnitude of line numbers per se does not influence execution time because two bytes represent the line number for all lines.

Save Time, Too

I bought a \$29 (U.S.) software

product called DOC, a valuable utility package. It is marketed by

```

10 FOR J=1 TO 10000
20 GOTO 30
30 NEXT
40 !"STOP"\END
50REM
60REM
70REM
80REM
90REM
100REM
110REM
120REM
130REM
140REM
150REM
160REM
170REM
180REM
190REM
200REM
210REM
220REM
230REM
240REM
250REM
260REM
270REM
280REM
290REM
300REM
310REM
320REM
330REM
340REM
350REM
360REM
370REM
380REM
390REM
400REM
410REM
420REM
430REM
440REM
450REM
460REM
470REM
480REM
490REM
500 GOTO 30

```

Listing 7. Program showing processing of GOTOs.

BUSINESS · PROFESSIONAL · GAME SOFTWARE FOR APPLE AND TRS-80

HOME FINANCE PAK I: Complete package \$49.95 Apple, TRS-80

- BUDGET:** The heart of a comprehensive home finance system. Allows user to define up to 20 budget items. Actual expense input can be by keyboard or by automatic reading of CHECKBOOK II files. Costs are automatically sorted and compared with budget. BUDGET produces both monthly actual/budget/variance report and a year-to-date by month summary of actual costs. Color graphics display of expenses. . . \$24.95
- CHECKBOOK II:** This extensive program keeps complete records of each check/deposit. Unique check entry system allows user to set up common check purpose and recipient categories. Upon entry you select from this pre-defined menu to minimize keying in a lot of data. Unique names can also be stored for completeness. Rapid access to check files. Check register display scrolls for ease of review. 40 column print-out. Up to 100 checks per month storage. Files accessible by BUDGET program. . . \$19.95
- SAVINGS:** Allows user to keep track of deposits/withdrawals for up to 10 savings accounts. Complete records shown via screen or 40 column printer. . . \$14.95
- CREDIT CARD:** Keep control of your cards with this program. Organizes, stores and displays purchases, payments and service charges. Screen or 40 column printer display. Up to 10 separate cards. . . \$14.95

THE UNIVERSAL COMPUTING MACHINE: \$39.95 Apple, TRS-80

- A user programmable computing system structured around a 20 row x 20 column table. User defines row and column names and equations forming a unique computing machine. Table elements can be multiplied, divided, subtracted or added to any other element. User can define repeated functions common to a row or column greatly simplifying table setup. Hundreds of unique computing machines can be defined, used, stored and recalled, with or without old data, for later use. Excellent for sales forecasts, engineering design analysis, budgets, inventory lists, income statements, production planning, project cost estimates—in short for any planning, analysis or reporting problem that can be solved with a table. Unique cursor commands allow you to move to any element, change its value and immediately see the effect on other table values. Entire table can be printed by machine pages (user-defined 3-5 columns) on a 40 column printer. Transform your computer into a UNIVERSAL COMPUTING MACHINE.

- COLOR CALENDAR:** HI-RES color graphics display of your personal calendar. Automatic multiple entry of repetitive events. Review at a glance important dates, appointments, anniversaries, birth days, action dates, etc. over a 5 year period. Graphic calendar marks dates. Printer and screen display a summary report by month of your full text describing each day's action item or event. Ideal for anyone with a busy calendar. . . (Apple Only) . . . \$19.95

BUSINESS SOFTWARE SERIES: Entire package \$199.95 Apple, TRS-80

- MICROACCOUNTANT:** The ideal system for the small cash business. Based on classic T accounts and double-entry bookkeeping, this efficient program records and produces reports on account balances, general ledger journals, revenue and expenses. Screen or 40 column printer reports. Handles up to 500 journal entries per period, up to 100 accounts. Instructions include a short primer in Financial Accounting. \$49.95
- UNIVERSAL BUSINESS MACHINE:** This program is designed to SIMPLIFY and SAVE TIME for the serious businessman who must periodically Analyze, Plan and Estimate. The program was created using our Universal Computing Machine and it is programmed to provide the following planning and forecasting tools.
CASH FLOW ANALYSIS PROFORMA BALANCE SHEET SOURCE AND USE OF FUNDS
PROFORMA PROFIT & LOSS SALES FORECASTER JOB COST ESTIMATOR
Price, including documentation and a copy of the base program. Universal Computing Machine. . . \$89.95

- INVOICE:** Throw away your pens. Use the ELECTRONIC INVOICE facsimile displayed on your CRT. The program prompts and you fill in the data. Includes 3 address fields (yours, Bill to and Ship to), Invoice No., Account No., Order No., Salesman, Terms, Ship Code, FOB Pt. and Date. Up to 10 items per sheet with these descriptions: Item No., No. of units, Unit Price, Product Code, Product Description, Total Dollar amount per item and invoice total dollar amount. Generates, at your option, hard copy invoices, shipping memos, mailing labels, audit copies and disc updates to master A/R files. (48K) . . . \$49.95

- BUSINESS CHECK REGISTER:** Expanded version of the Checkbook II program. Handles up to 500 checks per month with complete record keeping. (48K). . . \$29.95

- BUSINESS BUDGET:** As described above and companion program to Business Check Register. Handles 500 transactions per month, up to 20 cost categories. Accesses BCR files for actual costs. (48K) . . . \$29.95

ELECTRICAL ENGINEERING SERIES: Both programs \$159.95 Apple

- LOGIC SIMULATOR: SAVE TIME AND MONEY.** Simulate your digital logic circuits before you build them. CMOS, TTL, or whatever, if it's digital logic, this program can handle it. The program is an interactive, menu driven, full fledged logic simulator capable of simulating the bit-time by bit-time response of a logic network to user-specified input patterns. It will handle up to 1000 gates, including NANDS, NORs, INVERTERS, FLIP-FLOPS, SHIFT REGISTERS, COUNTERS and user-defined MACROS. Up to 40 user defined, random, or binary input patterns. Simulation results displayed on CRT or printer. Accepts network descriptions from keyboard or from LOGIC DESIGNER for simulation. Specify 1000 gate version (48K required) or 500 gate version (32K required) . . . \$89.95

- LOGIC DESIGNER:** Interactive HI-RES Graphics program for designing digital logic systems. A menu driven series of keyboard commands allows you to draw directly on the screen up to 15 different gate types, including 10 gate shape patterns supplied with the program and 5 reserved for user specification. Standard patterns supplied are NAND, NOR, INVERTER, EX-OR, T-FLOP, JK-FLOP, D-FLOP, RS-FLOP, 4 Bit COUNTER and N-BIT SHIFT REGISTER. User interconnects gates just as you would normally draw using line graphics commands. Network descriptions for LOGIC SIMULATOR generated simultaneously with the CRT diagram being drawn. Drawing is done in pages of up to 20 gates. Up to 50 pages (10 per disc) can be drawn, saved and recalled. Specify 1000 gate (48K) or 500 gate (32K) system . . . \$89.95

MATHEMATICS SERIES: Complete Package \$49.95 Apple only

- NUMERICAL ANALYSIS:** HI-RES 2 Dimensional plot of any function. Automatic scaling. At your option, the program will plot the function, plot the INTEGRAL, plot the DERIVATIVE, determine the ROOTS, find the MAXIMA and MINIMA and list the INTEGRAL VALUE. For 16K . . . \$19.95
- MATRIX:** A general purpose, menu driven program for determining the INVERSE and DETERMINANT of any matrix, as well as the SOLUTION to any set of SIMULTANEOUS LINEAR EQUATIONS. Disk I/O for data save. Specify 55 eqn. set (48K) or 35 eqn. (32K) . . . \$19.95
- 3-D SURFACE PLOTTER:** Explore the ELEGANCE and BEAUTY of MATHEMATICS by creating HI-RES PLOTS of 3 dimensional surfaces from any 3 variable equation. Disc save and recall routines for plots. Menu driven to vary surface parameters. Demos include BLACK HOLE gravitational curvature equations. \$19.95

ACTION ADVENTURE GAMES SERIES: Entire series \$29.95 Apple only

- RED BARON:** Can you outfly the RED BARON? This fast action game simulates a machine-gun DOG FIGHT between your WORLD WAR I BI-PLANE and the baron's. You can LOOP, DIVE, BANK or CLIMB in any one of 8 directions—and so can the BARON. In HI-RES graphics. . . \$14.95
- BATTLE OF MIDWAY:** You are in command of the U.S.S. HORNETS' DIVE BOMBER squadron. Your targets are the Aircraft carriers, Akagi, Soryu and Kaga. You must fly your way through ZEROS and AA FIRE to make your DIVE-BOMB run. In HI-RES graphics. . . \$14.95
- SUB ATTACK:** It's April, 1943. The enemy convoy is headed for the CORAL SEA. Your sub, the MDRAW, has just sighted the CARRIERS and BATTLESHIPS. Easy pickings. But watch out for the DESTROYERS—they're fast and deadly. In HI-RES graphics. . . \$14.95
- FREE CATALOG:** All programs are supplied in disc and run on Apple II w/Disc & Applesoft ROM Card & TRS-80 Level II and require 32K RAM unless otherwise noted. Detailed instructions included. Orders shipped within 3 days. Card users include card number. Add \$1.50 postage and handling with each order. California residents add 6% sales tax. Make checks payable to:



SPECTRUM SOFTWARE

DEALER INQUIRIES
INVITED

P.O. BOX 2084 142 CARLOW, SUNNYVALE, CA 94087 ✓ 306
FOR PHONE ORDERS - 408 738 4387

'CHANGE' - VARIABLE CHANGE

VARIABLE MAP

VARIABLE USED IN LINE

A	40	150	250	260	610	620	640
	650	660	680	690	710	800	
A\$	1010	1040	1050				
A1	40	150	250	250	320	320	610
	610	630					
A2	250	320	610	630			
A9	90	260	280	290	300	330	350
	360	370	390	430	430	440	450
	450	470	620	710	760	1160	
F	60	490	500	510			
I	80	90	100	240	260	270	280
	290	300	310	320	330	330	350
	360	370	390	400	400	420	420
	430	430	440	450	450	450	500
	530	540	600	620	740	750	760
	770	1200	1220	1230	1260	1290	
I1	270	470	530	580	700	700	710
J	140	170	550				
K	20	30	40	50	80	240	450
	530	530	600	780	790		
K1	40	730	730	750	780	790	790
	800						
K9	780	780	840	1110			
L	170	340	350	410	460	470	470
	480	1230	1260	1290			
L3	130	170	180	190	190		
L4	180	200	340	460			
L5	130	170	180	190	190		
M	200	210	210	210	220	220	220
	230						
N1	20	30	70				
N2	20	30	70				
N5	1150	1160	1160	1160	1160		
N8	70	500					
N9	140	1120	1140	1150	1200		
O	110	560	810	840	1090	1100	1100
	1130	1180	1350				
P	1030						
Q	160	300	300	310	350	390	390
	590	640	650	670	690	690	
R	160	280	290	300	310	350	360
	370	590	640	650	670	680	690
S\$	180	1160	1190	1240	1240		
T\$	190	1160	1190	1320	1320		
V	210	350	1160				
V\$	180	180	180	210	1210	1220	1230
	1240						
W	220	470	1160				
W\$	190	190	220	520	1210	1250	1260
	1290	1300	1300	1320			
Z	790	800	800	800	1030		

Listing 8. The variable map produced by DOC in processing CHANGE.

Mini Business Systems (PO Box 15587, Salt Lake City, UT 84115) in BASIC. DOC allows you to list a BASIC program; list all variables in a BASIC program and the number of each line in which each appears; list GOTOs and GOSUBs on a "from-to" basis; and optimize programs.

Listing is done on a page basis. Page length, spacing and output device are selectable, and a title, date and page number are placed at the top of each page. The listings of the variables and GOTO/GOSUBs are useful, particularly in debugging large programs, but really are by-products of the preparation for optimization.

The optimization is a gem. In executing GOTO/GOSUBs, the North Star interpreter "starts at

the top" and looks at successive line numbers until it finds the right one. The time required to execute a GOTO depends on how many lines down the program the specified line lies. If you run the program in Listing 7 and measure execution time, then repeat the process with line 20 changed to GOTO 500, you will see the significance of the search technique employed.

I ran Listing 6 in 13.9 seconds... 48 seconds when I altered line 20 to GOTO 500. The difference between the two runs was only the number of statement numbers scanned. Successively removing REMs from this program shows that the interpreter takes approximately 66 microseconds to scan a statement number. This mounts

up with GOTOs and GOSUBs within loops. Anything that places the subroutines and line

numbers most frequently "gone to" near the top of the program speeds up the program.

A reduction in the number of lines in a program also reduces the amount of searching required. Concatenating statements reduces the number of lines, and DOC uses this technique effectively.

In concatenating, you can remove REMs to optimize the program even further. Surprisingly, LET is not removed. DOC programs actually print the optimized program if required. Optimized programs are often barely readable and, if longer than the line-length maximum (132 characters) allowed by North Star, may not be edited or listed. Optimized programs are often much faster than their non-optimized starting point. The original copy is preserved if required.

I used DOC to optimize CHANGE. Listing 8 and 9 show portions of the output produced by DOC, and Listing 10 is what the optimized program would look like if it could be listed by the interpreter. The original program was 3274 bytes, the optimized version is 2010 bytes, a 39 percent reduction in memory requirement. When run again, the optimized CHANGE performed the same function referred to in Listings 3 and 4. Total run time was 11 minutes, 22 seconds, compared with the original run time of 13 minutes, 45 seconds, a saving of 17 percent in time.

I have three criticisms of the

'CHANGE' - VARIABLE CHANGE

GOTO FROM

20	810	820	1180	1360
400	350			
460	430	440		
530	380	450		
550	530			
580	110			
660	630			
680	660			
730	640	650		
740	720			
750	560			
830	50			
910	10			
1090	1100			
1150	1130			
1250	1280			
1290	1260	1310		
1320	1290			

Listing 9. GOTO map produced by DOC in processing CHANGE.

1225-322 p.—Master Handbook of Electronic Tables & Formulas—3rd Edition (\$14.95)

MASTER HANDBOOK OF ELECTRONIC TABLES & FORMULAS 3rd Edition

1146-504 p.—Radio Propagation Handbook (\$17.95)

RADIO PROPAGATION HANDBOOK

1212-504 p.—The Practical Handbook of Amateur Radio FM & Repeaters (\$15.95)

THE PRACTICAL HANDBOOK OF AMATEUR RADIO FM & REPEATERS

1169-504 p.—The GIANT Handbook of Computer Projects (\$15.95)

The GIANT Handbook of Computer Projects

ELECTRONIC MUSIC SYNTHESIZERS

1167-168 p.—Electronic Music Synthesizers (\$9.95)

1097-192 p.—All About Telephones (\$7.95)

All About Telephones

1066-882 p.—The Illustrated Dictionary of Electronics (\$19.95)

THE ILLUSTRATED DICTIONARY OF ELECTRONICS

1136-504 p.—Practical Electronics Math (\$15.95)

PRACTICAL ELECTRONICS MATH

1059-448 p.—The Complete Handbook of Magnetic Recording (\$15.95)

The Complete Handbook of Magnetic Recording

1222-266 p.—Advanced Radio Control, including Rockets & Robots—2nd Edition (\$12.95)

ADVANCED RADIO CONTROL including Rockets & Robots—2nd Edition

125-280 p.—Adding Solar Heat To Your Home (\$12.95)

ADDING SOLAR HEAT TO YOUR HOME

861-252 p.—Display Electronics (\$8.95)

Display Electronics

1234-240 p.—21 Custom Speaker Enclosure Projects You Can Build (\$12.95)

21 CUSTOM SPEAKER ENCLOSURE PROJECTS YOU CAN BUILD

1119-434 p.—Color TV Trouble Factbook—Problems & Solutions—4th Edition (\$12.95)

COLOR TV TROUBLE FACTBOOK Problems & Solutions

1255-308 p.—The Complete Shortwave Listener's Handbook—2nd Edition (\$14.95)

THE COMPLETE SHORTWAVE LISTENER'S HANDBOOK

806-420 p.—The Power Supply Handbook (\$12.95)

THE POWER SUPPLY HANDBOOK

1006-196 p.—Build-It Book of Solar Heating Projects (\$9.95)

BUILD-IT BOOK OF SOLAR HEATING PROJECTS

HOW TO REPAIR CLOCKS

1168-182 p.—How To Repair Clocks (\$9.95)

1199-476 p.—The Master IC Cookbook (\$15.95)

THE MASTER IC COOKBOOK

1113-182 p.—Understanding Electronics (\$8.95)

Understanding Electronics

Facts About Club Membership

- The 4 introductory books of your choice carry publisher's retail prices of up to \$69.80. They are yours for only \$1.49 for all 4 (plus postage/handling) with your Trial Membership.
- You will receive the **Club News**, describing the current Selections, Alternates, and other books, every 4 weeks (13x a year).
- If you want the Selection, do nothing, it will be sent to you automatically. If you do not wish to receive the Selection, or if you want to order one of the many Alternates offered, you simply give instructions on the reply form (and in the envelope) provided, and return it to us by the date specified. This date allows you at least 10 days in which to return the form. If, because of late mail delivery, you do not have 10 days to make a decision and so receive an unwanted Selection, you may return it at Club expense.
- To complete your Trial Membership, you need buy only four additional monthly Selections or Alternates during the next 12 months. You may cancel your Membership any time after you purchase these four books.
- All books—including the Introductory Offer—are fully returnable after 10 days if you're not completely satisfied.
- All books are offered at low Member prices, plus a small postage and handling charge.
- **Continuing Bonus** If you continue after this Trial Membership, you will earn a Dividend Certificate for every book you purchase. Three Certificates plus payment of the nominal sum of \$1.99 will entitle you to a valuable Book Dividend of your choice which you may choose from a list provided Members.

An Extraordinary Offer to introduce you to the benefits of Membership in

ELECTRONICS BOOK CLUB

take any **4** of these 20 unique electronics books **\$1.49** for **ALL FOUR** (values to \$69.80) for only

with a Trial Membership in the Book Club that guarantees to save you 25% to 75% on a wide selection of electronics books

May we send you your choice of 4 of these practical time-and-money-saving books as part of an unusual offer of a Trial Membership in Electronics Book Club?

Here are quality hardbound volumes, each especially designed to help you increase your know-how, earning power, and enjoyment of electronics. Whatever your interest in electronics, you'll find Electronics Book Club offers practical, quality books that you can put to immediate use and benefit.

This extraordinary offer is intended to prove to you through your own experience, that these very real advantages can be yours...that it is possible to keep up with the literature published in your areas of interest, and to save substantially while so doing. As part of your Trial Membership, you need purchase as few as four books during the coming 12 months. You would probably buy at least this many anyway, without the substantial savings offered through Club Membership.

To start your Membership on these attractive terms, simply fill out and mail the coupon today. You will receive the 4 books of your choice for 10-day inspection. **YOU NEED SEND NO MONEY.** If you're not delighted, return the books within 10 days and your Trial Membership will be cancelled without cost or obligation.

ELECTRONICS BOOK CLUB, Blue Ridge Summit, Pa. 17214

ELECTRONICS BOOK CLUB

Blue Ridge Summit, Pa. 17214

Please open my Trial Membership in **ELECTRONICS BOOK CLUB** and send me the 4 books circled below. I understand the cost of the books I have selected is only \$1.49 for all 4, plus a small shipping charge. If not delighted, I may return the books within 10 days and owe nothing, and have my Trial Membership cancelled. I agree to purchase at least four additional books during the next 12 months after which I may cancel my membership at any time.

806 861 1006 1059 1066 1097 1113
1119 1136 1146 1167 1168 1169
1196 1199 1212 1222 1225 1234 1255

Name _____ Phone _____

Address _____

City _____

State _____ Zip _____

(Valid for new Members only. Foreign and Canada add 15%.) MC-880


```

10GOTO 910
20READ#0,6K,6N1,6N2,NOENDMARK\LETK1=K\LETA=0\LETA1=0\IFK=1THEN 830\LETF=0\N8=N2*2*6+N1\FORI=1TOK-3\READ#0,6A9(I)
\NEXTI\IFO=2THEN 580\L5=0\L3=0\FORJ=1TON9\A1=0\A=0\Q=-1\R=0\L5=L(J)+L3\VS=""\VS=SS(L3+1,L5)\L4=LEN(VS)\WS=""\WS=TS(L3+1,L5)\L3=L5\FOR
RM=1TOL4\V(M)=ASC(VS(M,M))
220W(M)=ASC(WS(M,M))\NEXTM\FORI=1TOK-3\A2=A1\A1=A\A=A9(I)\I1=I\IFA9(I)=143THENR=1\IFA9(I)=92THENR=0\IFA9(I)=34ANDR=0THENQ=-Q\IFQ=10
RR=1THENNEXTI\IFA1=154ORA2=154ORA1=150THENNEXTI\IFA9(I)=38THENNEXTI\FORL=1TOL4\IFA9(I)=V(L)ANDQ=-1ANDR=0THEN 400\IFA9(I)=92THENR=0\I
FA9(I)=143THENR=1\EXIT 530\IFA9(I)=34THENQ=-Q
400I=I+1\NEXTL\I=I-1\IFA9(I+1)=44ORA9(I+1)=41THEN 460\IFA9(I+1)=13THEN 460\IFI<K-4ANDA9(I+1)>32ANDA9(I+1)<91THEN 530
460FORL=1TOL4\A9(I1-1+L)=W(L)\NEXTL\IFF=0THEN\IFF=0THEN\6I,N8,TAB(15),\F=1\IW$, " ",
530IFI1>K-3ORI>K-3THEN 550\NEXTI
550NEXTJ\IFO=1THEN 750
580I1=0\Q=-1\R=0\FORI=1TOK-3\A2=A1\A1=A\A=A9(I)\IFA1=154ORA2=154THEN 660\IFA=32ANDQ=-1ANDR=0THEN 730\IFA=128ANDQ=-1ANDR=0THEN 730
660IFA<92THEN 680\Q=-1\R=0
680IFA=143THENR=1\IFA=34ANDR=0THENQ=-Q\I1=I1+1\A9(I1)=A\GOTO 740
730K1=K1-1
740NEXTI
750FORI=1TOK1-3\WRITE#1,6A9(I),NOENDMARK\NEXTI\K9=K9+K-K1\IFK<>K1THENWRITE#1LZ,6K1,NOENDMARK\Z=Z+K1\READ#1LZ-1,6A\IFO=2THEN 20\GOTO
20
830I\IFO>1THENIK9," CHARACTERS REMOVED"\CLOSE#1\CLOSE#2\I1\I1" FINISHED"\I1\I1\END
910I" PROGRAM TO CHANGE VARIABLE NAMES "\I" IN NORTH STAR BASIC PROGRAMS (RELEASE 4) "\I1" WRITTEN BY DR. D.J.YATES"\I"
BOTANY DEPARTMENT"\I" UNIVERSITY OF QUEENSLAND"\I" ST. LUCIA,4067"
980I" QUEENSLAND,"\I" AUSTRALIA,"\I1\I1\INPUT" WHAT IS BASIC PROGRAM FILE NAME ?",AS\I\LETS=0\P=0\
OPEN#0,2,AS\OPEN#1LZ,AS\I"YOU MAY: (1) Alter Variable Names"\I" (2) Delete Blanks and 'LET'"
1080I" (3) Perform both (1) and (2)"
1090INPUT"WHICH OPTION ? ",O\IFO<10R0>3THEN 1090\K9=0\N9=1\IFO=2THEN 1150\INPUT" HOW MANY VARIABLE NAMES DO YOU WANT TO CHANGE ? ",
N9
1150N5=N9*2\DIMAS(255),SS(N5),TS(N5),V(N5),W(N5)\I\IFO=2THEN 20\SS=""\TS=""\FORI=1TON9\VS=""\WS=""\I" VARIABLE NO ",I," "=",\INPUT1"
",VS\L(I)=LEN(VS)\SS=SS+VS
1250INPUT" TO BE REPLACED BY ",WS\IFLEN(WS)<=L(I)\THEN 1290\I" NAME MUST NOT BE LONGER THAN THAT BEING REPLACED "\GOTO 1250
1290IFLEN(WS)=L(I)\THEN 1320\WS=WS+" "\GOTO 1290
1320TS=TS+WS\NEXTI\I\IFO>2THEN\STATEMENT VARIABLE"\GOTO 20\END

```

Listing 10. CHANGE after processing by DOC.

copy of DOC I received. The reserved word ERRSET was not included in its "repertoire"—not really a problem since Mini Business Systems has devised a clever way of updating DOC to cater to all new reserved words in future releases of North Star BASIC. Second, BASIC pro-

grams have to be converted to data files before being processed by DOC. This is annoying, particularly because the Release 4 of North Star BASIC used allows any file type to be accessed as a data file. The most glaring problem with the system is that it doesn't handle

multiline functions properly. A program containing functions will not run if it has been optimized, but you can use a feature of DOC to prevent optimization of segments within a program. This overcomes the problem.

Overall, the DOC package is

excellent. A nice bonus is a small program called GOTO-SUB, a clever routine that is an implementation of the "GOTO N" statement. It is used in part of the DOC package and could significantly improve the runtime of many BASIC programs. ■

OSI

SOFTWARE FOR OSI

OSI

We Have Over 100 High Quality Programs For Ohio Scientific Systems

ADVENTURES AND GAMES

Adventures - These interactive fantasies will fit in 8K! You give your computer plain english commands as you try to survive.

ESCAPE FROM MARS

You awaken in a spaceship on Mars. You're in trouble but exploring the nearby Martian city may save you.

DEATHSHIP

This is a cruise you won't forget - if you survive it! Adventures \$14.95 Tape or 5 1/4" Disk \$15.95 8" Disk

STARFIGHTER \$5.95

Realtime space war with realistic weapons and a working instrument panel.

ALIEN INVADER 6.95 (7.95 for color and sound)

Rows of marching munching monsters march on earth.

TIME TREK \$9.95

A real time Startrek with good graphics.

BATTLEPAC \$17.95

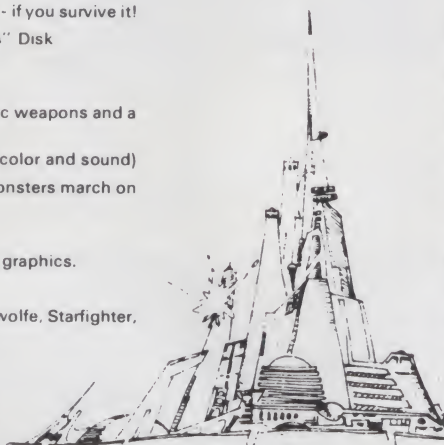
For the battlebuff. Contains Seawolfe, Starfighter, Bomber and Battlefleet.

And lots, lots, lots more!



Our \$1.00 catalog contains a free program listing, programming hints, lists of PEEK and POKE locations and other stuff that OSI forgot to mention and lots more programs like Modem Drivers, Terminal Programs, and Business Stuff.

Aardvark Technical Services 1690 Bolton, Walled Lake, MI 48088 (313) 624-6316



TEXT EDITORS FOR ALL SYSTEMS!!

These programs allow the editing of basic program lines. All allow for insertion, deletion, and correction in the middle of already entered lines. No more retyping.

C1P CURSOR CONTROL (Text Editor) \$9.95

Takes 166 bytes of RAM and adds, besides text editing, one key instant screen clear.

C2P/C4P CURSOR \$9.95

Takes 366 BYTES to add PET like cursor functions. Enter or correct copy from any location on the screen.

SUPERDISK \$24.95 for 5" \$26.95 for 8"

Has a text editor for 65D plus a great new BEXEC*, a renumbere, search, a variable table maker and Diskvu - lots of utility for the money.

We also have 25 data sheets available such as:

IMPLEMENTING THE SECRET SOUND PORT ON THE C1P \$4.00

HOW TO DO HIGH SPEED GRAPHICS IN BASIC \$4.00

HOW TO READ A LINE OF MICROSOFT \$1.00

JOYSTICK INSTRUCTIONS AND PLANS FOR C1P \$3.00

SAVING DATA ON TAPE \$4.00

THE AARDVARK JOURNAL

A tutorial bimonthly journal of how to articles \$9.00



91

Data Terminals From MICROMAIL? YES,

Because We Offer....

...A 'Personal Approach'

Towards the Quick and Efficient Handling of Your Individual Order.

...Inventory.

The Equipment You Select is Readily Available from Our Stock.

...Terminals Only.

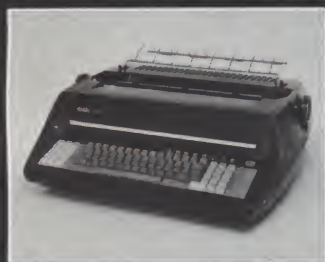
We Specialize in Data Terminal Equipment.



DIABLO 1650

- Prints at 40 cps, using 88, 92, or 96 char. metalized printwheels.
- Vertical resolution 1/48"; Horizontal 1/120". Capable of proportional spacing, bidirectional printing, and graphics under software control.
- Bidirectional normal and direct tabs. Left, right, top and bottom margins.

R.O. \$2890.00
KSR \$3285.00



DIABLO 1640

- Uses plastic printwheel and prints at 45 cps. Otherwise, shares identical features with 1650 including:
 - Friction or tractor feed, up to 15" wide.
 - Cartridge ribbon, fabric or carbon.

R.O. \$2745.00
KSR \$3140.00



DEC LA 34

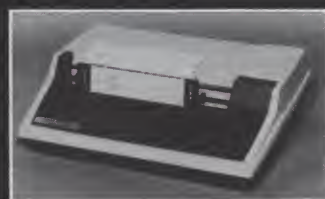
(Shown with optional forms tractor and numeric keypad)

- Prints 10, 12, 13.2, or 16.5 characters per inch, upper/lower case.
- 2, 3, 4, 6, 8, or 12 lines per inch.
- Friction feed, paper width to 15 inches.

\$999.00

Options:

- Numeric keypad — **\$80.00**
- Adjustable forms tractor — **\$130.00**



T.I. 810

- Includes upper/lower case option.
- Bidirectional printing at 150 cps.
- Tractor-feed forms, 3" to 15" wide.

\$1599.00

Options:

- Forms length control — **\$90.00**
- Vertical Format Control with Compressed Print — **\$253.00**



SOROC IQ 120

- Displays 80 x 24, upper/lower case.
- Separate numeric keypad and cursor keys.
- Protected fields displayed at reduced intensity.

\$740.00



SOROC IQ 140

- 117-key detachable keyboard with numeric cluster and cursor control.
- Insert/delete line, insert/delete character.
- Underline, blink, reverse, 1/2 intensity, protected and blank fields.
- Printer port with independent baud rate — prints line, partial or full screen.

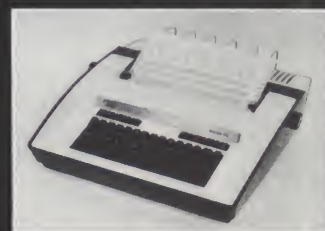
\$1130.00



TEC 510

- Reverse video, blinking, underline, 1/2 intensity, protected fields, blank security field.
- Transmit character, line, partial page, page, or unprotected data.
- Cursor up, down, left, right, return, home, plus load and read.

\$750.00
(in quantities)



TELETYPE 43

- Prints 132 columns, upper/lower case with true descenders.
- 30 character/second print speed. 110-300 baud.
- Uses 12" wide by 8.5" pinfeed paper.
- Print position scale, paper guide and supply rack.

\$999.00

To Order:

Send check or money order to: **MICROMAIL, P.O. Box 3297, Santa Ana, CA 92703.** Personal or company checks require two weeks to clear.

Terminals in stock are shipped the business day after receipt of certified funds.

All equipment includes factory warranty.

MICROMAIL™

MICROMAIL • BOX 3297 • SANTA ANA, CA 92703

(714) 731-4338

Shipping:

We ship freight collect by UPS when possible. Larger terminals are shipped by motor freight. Air and express delivery is available on all products.

Why Do You Need Two Disks?

A good question. Here are some answers.

James W. Stutsman
3139 Oak Hill Rd.
Carrollton, TX 75007

In the early days of computers (before Intel discovered silicon), there were no disk operating systems, or disks, for that matter. Computers of the day were monstrous and used large amounts of power and took up massive amounts of space. Some of the larger ones had nearly the power of an 8008.

The programmers of this time had to do everything on tape or punched cards. Any required operating system functions were included with their programs. The high cost of computing made this scheme impractical, although these computers were a type of personal computer.

In an attempt to recover some of the time lost when the computer changed from one user to another, the batch processing operating system was born. Users submitted their programs and data on punched cards, which were read onto a tape. When the tape became full, it was processed and the output was distributed to the users.

Improvements in hardware architecture, including the introduction of random access disk drives, allowed operating systems to become more versatile. This, in turn, allowed more effective use of the available computer power. These operating systems relied upon the disk as their primary storage device and thus became generally known as disk operating systems (DOS). Even now, most of the operating systems used on the larger computers are disk-based. However, all of this convenience and power con-

sumes as much as 40 percent of the computer's resources.

One Small Step

With the introduction of personal computers in 1975, the industry changed irrevocably. Now the power of the computer could be allocated in a one-on-one basis economically. Evolution of the operating systems for personal computers followed that of their larger brethren. These first computers had no operating system, and the programmer had to do everything (in between RAM failures). Mercifully, the batch processing stage was bypassed, probably because keypunch machines were beyond hobbyist budgets.

When floppy disks for microcomputers were introduced, the first DOS programs began to appear. These have been written mainly by big-computer programmers determined to bring the world a better DOS. Some of these efforts have been quite remarkable, producing big-computer operating systems in miniature. This has led people to rally behind their favorite DOS, forsaking all others, and attempting to convert nonbelievers.

Shortcomings

Unfortunately, it has become the norm to evaluate new computers and disk systems by the power of their DOS. Too much emphasis has been placed on the importance of DOS. Sophisticated disk operating systems are not necessary on personal computers and are actually detrimental to them. The current crop of disk operating systems has been written by programmers for programmers to use. Users of such systems may have

to read a 60-page manual (or worse, have no manual) just to use them. This may, in part, explain why the so-called "home" computer has appeared only in the homes of computer professionals.

Secondly, these systems solve problems that don't exist. One example is in the area of file allocation. Most of the disk operating systems now offered have complex logic in them to allocate disk space to a program dynamically as it runs. This means that every sector of every disk will be used. The cost for this service, however, is a general slowing of disk read/write operations and making random access of disk files difficult to impossible. All of this to conserve real estate on a diskette that costs \$4.50?

Disk operating systems are programs that make demands on the resources of a computer. Typical DOS memory requirements range from 8K to as much as 20K bytes of memory. This means that the user either has to restrict his memory usage or buy more memory to use a disk. Once he has his disk, he will find that the DOS wants a piece of it, too. Thirty percent or more of the system disk is used for DOS-related data, making it unavailable to the user. Thus, two drives may have to be used even though all of the data would fit on one.

A typical DOS may consist of several thousand lines of source code. In a program of this size even the best, most experienced, programmer may make a mistake. Large-computer manufacturers expect and plan for software crashes. They have support personnel available to assist the user in the recovery of his data files. A

personal computer buyer has no way of knowing about this possibility and nowhere to turn when it occurs.

DOS Requirements

What constitutes a good DOS for a personal computer? Several key items need to be provided:

1. It must provide for a simple means of saving and loading programs.

2. It must provide the necessary basics to access the disk in a direct (i.e., random) manner from a program written in a high-level language such as BASIC. All input and output functions should be handled by the DOS, as well as head positioning, error retries and error recovery.

3. It must make minimal demands on RAM memory, preferably using less than 8K. No part of the disk should be used except for the minimal amount needed to store the DOS itself.

DOS owners may wonder, "How can you do anything with such a simple DOS? You haven't even provided for a directory!" The whole point is that the application program will provide whatever DOS features it needs without bearing the overhead

of a lot of features that it does not need.

For example, if a program uses all of a disk for a single inventory file, does it really need a directory of that disk? If a directory is needed, why not build it in the form most useful to the application? In this way, the least de-

ten than to build a timebomb that expires with "DISK FULL IN 600"?

At first glance, it may appear that all you really have with your simple DOS is a fast cassette. Any feature of a big DOS that a user needs can be implemented in high-level language by the user. He also has full random ac-



It may appear that all you really have with your simple DOS is a fast cassette.



mands are made on the resources of the computer while providing the programmer with the capability to mold the operating system to best suit his application.

If the programmer can access the entire disk, then he has to do his own file allocation. He may even overwrite a file destroying the one following it! To remedy this the programmer has to plan how his files will grow and build that knowledge into the application. Isn't it better to take care of that at the time the program is writ-

cess capability of the entire diskette. Look at a complex DOS whose threaded files prevent random access and tell me again who has the "fast cassette."

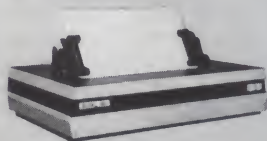
It is not my intention to downgrade any of the disk operating systems being marketed today for the personal computer hobbyist. If a big DOS is your main interest, then by all means use it. But don't make the assumption that such a DOS is essential for successfully installing an application on a personal computer. ■

PRINTERS & CRT'S From Orange Micro



base 2 inc.

IMPACT PRINTER
\$649.00



"The base 2 outperforms every printer in its price range. Do a comparison and see for yourself..."

★ GRAPHICS ★ TRACTORS / FRICTION FEED

• 2K Input Buffer • RS-232 Serial, Centronics® Parallel, IEEE-488, 20 ma • TRS-80 Cable option • 60 LPM - 100 CPS • Fast form feed • User programmable character set • 64, 72, 80, 96, 120, 132 Columns / line • Expanded characters • 9.5" wide paper • Automatic skip-over-perforation • Horizontal & Vertical tabs • Programmable vertical line spacing • Intel 8085 Microprocessor — over 40 software commands • Self test • 15 Baud rates to 9600 Baud • Optional foreign character sets

Interfaces to TRS-80, Apple, Atari, PET, Northstar, and most other computers.



TELEVIDEO CRT'S PRICES SLASHED!

912C \$ CALL
920C \$ CALL

PRINTERS

AXIOM
IMP-1 629
IMP-2 715
Other models \$ Call
CENTRONICS
779 w/tractors 1059
730 \$ Call
737 \$ Call
COMPRINT
912 Parallel 499
912 Serial 535

OKIDATA
Microline 80 659
w/tractors 779

PAPER TIGER
IDS 440 869
w/graphics 959

QUME
Letter Quality 5/45 2499
w/tractors 2684

TOLL FREE (800) 854-8275

CALIF. ONLY (714) 630-3322

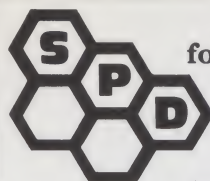
Call for FREE CATALOG



Phone orders WELCOME. Same day shipment for VISA, MASTER CHARGE, and AMERICAN EXPRESS. Personal checks require 2 weeks to clear. Add 3% for shipping and handling. California residents add 6%. Manufacturer's warranty included. Prices subject to revision.

Orange Micro
P.O. Box 2076
Yorba Linda, CA 92686





for . . .

OHIO SCIENTIFIC

just released . . .

Problem Solver: Makes complex decisions based on your criteria. You can't be without it.

Cash Flo: Every item can have a six-point growth curve—All other cash flow packages are now obsolete.

Numerology: At last, SPD makes this accurate tool of the occult available to you. (Source book \$10)

The Tool Box: Modules in a series of tools for specific business problems . . .

Real Pak 1: Real estate investment property analysis. Built for pros. Gives you the "hammer" in any deal.

Baccus 1: MDMS compatible or stand alone invoicing and order entry module. We can't be without it.

\$30 Disk \$15 Tape (limited versions)
Specify 8" or 5", C1 or C2. Or, Send \$2 for full-line documentation package

STRUCTURED PROGRAM DESIGNERS
371 Broome St., NY, NY 10013



✓ 162



THE BEST IN SOFTWARE FROM COMPLEAT SYSTEMS

NON-PROFIT/SERVICE INDUSTRY ACCOUNTING

For TRS-80 and CPM. In use over 2 yrs. A partner of a big 8 acct firm said "... the best accounting program I have seen ... does in a few pages what is frequently not done in 50 ...". Unique features include:

- Twice as fast as other systems
- Common sense accounting—no debits or credits
- Budgets, prior year, and year-to-date
- Current status available at all times
- 8 separate Funds or Co's allowed
- over 2000 accounts allowed
- standard 8 1/2 x 11 output
- one year free update service

Min. system 2 disk, 32K TRS-80 or 1 disk, 48K Z-80 CP/M
\$695/\$35 manual. Complete systems also available.
Payroll avail. Aug. 80: A/R, A/P, 8080 ver. avail. soon.

SECURITY FOR TRS-80 AND CPM

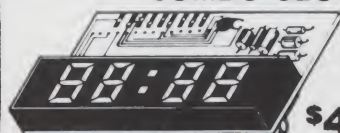
The best security system available. Automatically encodes/decodes all data to/from disk. A billion billion (10¹⁸) combinations. Typical uses include: proprietary, sales, financial, tax, or confidential client information; and time sharing/multi user systems such as Source, Micronet, etc.

\$49.95 Min. systems 1 disk, 16K, TRS-80 or 24K CP/M.

\$500 FREE to first to decode our sample message.

COMPLEAT SYSTEMS 9551 Casaba Ave. Chatsworth, CA 91311 213-993-1479
✓ 94 Master Charge and VISA accepted. CA residents add 6% tax.
TRS-80 and CPM are registered trademarks of Tandy Corp and Digital Research

THE ZULU IS BACK! NATIONAL SEMICONDUCTOR MILITARY TIME FORMAT! JUMBO CLOCK MODULE



\$4.95

**MA1001C
BRAND NEW!**

- FEATURES:**
- FOUR JUMBO 1/2" LED DISPLAYS
 - 12 HR. REAL TIME FORMAT
 - 24 HR. ALARM SIGNAL OUTPUT
 - 50 OR 60 Hz OPERATION
 - LED BRIGHTNESS CONTROL
 - POWER FAILURE INDICATOR
 - SLEEP & SNOOZE TIMERS
 - DIRECT LED DRIVE (LOW RF)
 - COMES WITH FULL DATA

ASSEMBLED! NOT A KIT!

Add \$1.95 for AC XFMR

PERFECT FOR USE WITH A TIMEBASE.

ALARM CLOCK KITS: 4 Digit .5"

Here it is! The first of several quality kits we have been asked for: Here is what you get — unbelievable as it may sound....

- 1 National - 5375AA Clock Chip
- 1 Bowmar Clock Stick Readout (L.E.D.) 4 digit - 1/2"
- 13 Transistors
- 2 Push Buttons for time set
- 2 Toggle Switches for alarm
- 1 Filter cap
- 4 1N4000 series diodes
- 1 1N4148
- 2 Disc caps
- 29 Resistors
- 1 Transducer (Speaker) for Alarm
- 1 LED Lamp for alarm indicator

D. C. MODEL
Includes 60 Hz timebase

This Kit Includes:

- 1 National 5375AA Clock Chip
- 1 Bowmar Clock Stick Readout - (L.E.D.) 4 digit - 1/2"
- 12 Transistors
- 2 Push Buttons for time set
- 2 Disc caps
- 27 Resistors
- 1 MOV
- 1 60 Hz timebase

ORDER
KIT
CK-100AC

P.C. Board — **\$2.25**
Plug In
Transformer — **\$1.50**
Case — **\$3.50**

ORDER
KIT
CK-100DC

\$12.75

P.C. Board — **\$2.25**

LAB-BENCH VARIABLE POWER SUPPLY KIT

**\$12.00 KIT
SUPER SALE**

5 to 20 VDC at 1 AMP. Short circuit protected by current limit. Uses IC regulator and 10 AMP Power Darlington. Very good regulation and low ripple. Kit includes: PC Board, all parts, large heatsink and shielded transformer. 50 MV. TYP. Regulation.

60 Hz CRYSTAL TIME BASE

\$4.95 (Complete Kit)

Uses MM5369 CMOS divider IC with high accuracy 3.579545 MHZ Crystal. Use with all MOS Clock Chips or Modules. Draws only 1.5 MA. All parts, data and PC Board included. 100 Hz same as above except **\$5.95**

16K DYNAMIC RAM CHIP - WORKS IN TRS-80 OR APPLE II

16K X 1 Bits. 16 Pin Package. Same as Mostek 4116-4.250 NS access 410 NS cycle time. Our best price yet for this state of the art RAM 32K and 64K RAM boards using this chip are readily available. These are new, fully guaranteed devices by a major mfg.

VERY LIMITED STOCK! 8/\$59.95

SONY 23 WATT AUDIO AMP MODULE

#STK.054 23 Watts super clean audio 20 Hz to 100 KHZ + 2 DB. Hybrid, silicon, self contained module only 1 1/4 x 2 1/2 in. with data. Compare at up to twice our price! **\$6.50 each.**

REPEAT OF A SELL-OUT!

VECO precision thermistor glass type VECO #41A728.2K ohms at room temp **VERY** sensitive. Individually packaged in plastic vials. \$3.00 value.

\$1.00 each or 3 for \$2.50

5-14 V.D.C. BETTER BEEPER

Two audio oscillator — a low frequency pulse oscillator — either or both audio frequencies can be shifted (warbled) or pulsed on and off. Constant tone capability. any combination of pulses and warbles or tones. 1 1/2" x 1 1/4"

ALARMS—TOYS—TESTING—ETC.

P.C. Bd. & Complete Kit **\$3.55 or 3 for \$9**

Digital Research: Parts (OF TEXAS)

P.O. BOX 401247C GARLAND, TEXAS 75040 • (214) 271-2461

TERMS: Add 50¢ postage, we pay balance. Orders under \$15 add 75¢ handling. No C.O.D. We accept Visa, MasterCard and American Express cards. Tex. Res. add 5% Tax. Foreign orders (except Canada) add 20% P&H. 90 Day Money Back Guarantee on all items. Write for our free catalog full of many useful bargains.

NOWFastest
Data Manager**PET™****JINSAM™**

- ★ CUSTOM DATA FILES
- ★ CUSTOM REPORTS/LABELS
- ★ KEYED RANDOM ACCESS
- ★ FAST/EASY/MENU DRIVEN
- ★ MULTIPLE SEARCH KEYS
- ★ PRIVACY ACCESS CODES
- ★ WILD CARD SEARCH

Specify CBM 2040 or COMPU/THINK DISK

INTRODUCTORY OFFERPACKAGE **\$150**

USERS GUIDE ONLY \$25

DEMO TAPE \$5 DISK \$8
(REFUNDABLE WITH PURCHASE)

Powerful user commands. Self explanatory, easy to use. Straight forward input and editing routines - "idiot proof". Create any desired relationship.

Optional STATISTICS, MATH, PTE WORD PROCESSOR packages

TYPICAL APPLICATIONS: Personnel files, Customer files, Inventory, Sales records, School records, Appointment schedules, Real estate /Apartment listings, Subscription lists, Research surveys, Mailings.

Send Check or Money Order plus \$2 Shipping
(NY residents add 8% Sales Tax)

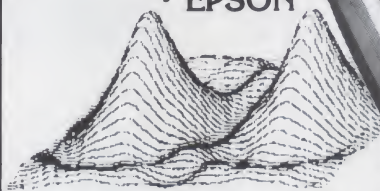
- DEALER INQUIRIES WELCOMED -

JINI MICRO-SYSTEMS, Inc. ✓ 164

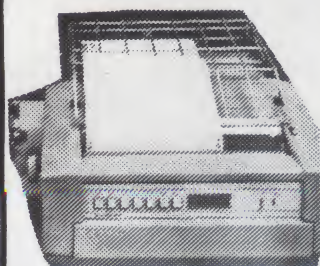
P.O. Box 274-K • Bronx, NY 10463

NOW PRINT APPLE®HIRES- GRAPHICS NORMAL,
INVERSE, IN 2 SIZES.**TX-80 PRINTER**

by EPSON

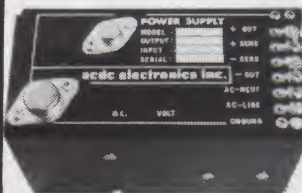
**\$795.**

THE TX-80 MATRIX PRINTER with GRAFTRAX

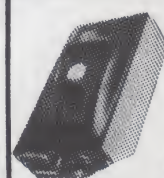
SPEED: 58 LPM, 125 CPS**INTERFACES:** Parallel standard IEEE488 and serial RS-232
optional, (Apple type parallel card and
cable *99.)**CHARACTER SET:** Full 96 Character ASCII Set (upper and
lower case with expanded print).**PRINT HEAD:** 100 x 10⁶ character life expectancy.**GRAFTRAX OPTION*** full dot addressable graphics (480 dots/
line) with Automatic print head protec-
tion on dense pictures plus form feed
and skip over perforation.**FREE! APPLESOFT-WARE** for graphics dump included*UPDATE EARLIER TX-80's TO GRAPHICS for **\$99.**Mastercharge & Visa O.K.
DEALER INQUIRIES INVITED ✓ 97**Computer Corner of New Jersey**439 Rt. 23, Pompton Plains, N.J. 07444 (201) 835-7080
PRICES SUBJECT TO CHANGE**RONDURE COMPANY** ✓ 742522 BUTLER ST
DALLAS, TEXAS 75235
214-630-4621**the computer room****SPECIAL**
Printer for your
Microcomputer**GE TERMINET
300 PRINTER**

Pin feed—9" paper

- 80 Print positions
 - Receive only
 - ASCII code
 - RS-232 interface
 - 30 CPS
 - Upper & lowercase
 - Shipping wt 75#
- Shipping containers \$15.00.
(used)
(good working condition)

Will run on serial RS232 port of
most micros including TRS-80. **\$450.00****WE HAVE FLAT-PACK
ACOUSTIC**Modem
pickup**\$19⁵⁰****USED FANS**Muffin — 8.00
Sprite — 4.00**NEW
POWER
SUPPLY**5V at 3 Amp
12V at 6 Amp
-12V at 3 Amp**USED
POWER
SUPPLY**5V at 12 Amp
16V at 6 Amp
6V at 2 Amp**NEW
POWER SUPPLY**
(AC-DC Brand)Model 1-22V @ 1.9a **\$20.00**
Model 2-15V @ 2.4a **\$30.00****MICRO SWITCH KEYBOARD**
USED BUT LOOKS VERY NICE

ASC II

\$40.00
(With Print)**USED
OMNITEK**MODEM
ORIGINATE
ONLY
TESTED**\$90.00 Sale**

ORDERING INFORMATION:
We ship the same day we receive a certified check or money order.
Texas residents add 5% sales tax. Please call if you have a question.
Write for our CATALOG of many parts, terminals, printers, etc.
All items subject to availability. Your money returned if we are
out of stock.

SHIPPING INFORMATION:
Modems: \$3.00 each; Key Boards \$4.00, Power Supply \$7.00.
Large Items & Parts: Specify Freight or Air Freight Collect.
Foreign Orders: Add appropriate freight or postage.
We now take Master Charge and Visa orders. Specify full number,
bank number and expiration date.

Disassembler For the Heath H8

*The DIS-8 program is self contained
and should be adaptable to other 8080 and 8085 systems.*

Patrick Swayne
290 Springdale
Sebastopol, CA 95472

Adapting software from one computer make to another can be a challenge, especially if the software needs RAM where there isn't any and no source listing is available. This is the problem I encountered when I decided to adapt Cromemco's Control BASIC to my Heath H8.

Control BASIC is designed to reside in ROM starting at 344000A (A is Heath's designation for split octal notation) and use RAM starting at 2000A. There is no problem with the high address, but Heath requires the first 8K+ of RAM in their machine, and user RAM

starts at 040100A.

The obvious need to make some changes to Control BASIC prompted me to write the disassembler (see Listing 1). This program (DIS-8) occupies about 2.5K of memory space at the bottom of the H8's user RAM area. It is self sufficient, including I/O routines, and could easily be adapted to other 8080- or 8085-based computers. (Note: The console driver was written for the H8-5 interface card. The newer H8-4 card requires different software.)

Program Operation

The output of DIS-8 resembles that of Heath's assembler, HASL-8. Each line contains the current address in split octal, the op code that is there, the

data that follows two- and three-byte instructions, the mnemonic for the instruction, with data, if any, and a comment based on the ASCII value of the op code and data. The comments, which are always introduced by an asterisk (*), are produced as follows.

First, the most significant bit is stripped, and the result is checked. If it is a lowercase letter (over 137Q), it will be capitalized. This allows operation on Heath's H9 terminal or other uppercase-only terminals. If the number is below 137Q, it will be checked to see if it is below 041Q, in which case it will not be printed, and a space will be left in its place. A sample run of DIS-8 is shown in Listing 2.

In order to produce neat columns with plenty of space between them, an output buffer is used. Each part of a line of dis-

assembly is placed into its position in the buffer; then the entire buffer is printed and cleared for the next line by filling it with ASCII spaces. To ensure the correct number of spaces between the parts of two-part mnemonics (such as "STAX B"), a number, included in the table of mnemonics, indicates how many spaces to use. Thus, "STAX B" appears in the table as 'STAX',6,'B'.

Disassembly is accomplished by first fetching the op code pointed to by the address pointer. The instruction is then compared to a table of two- and three-byte op codes, and the program then branches to one of three routines. In the case of one- and two-byte instructions, the op code and data, if any, are placed in the buffer. Then the mnemonic printing routine is called, which looks up the op

ENTER STARTING ADDRESS: 040 100

```
040.100 006 172 MVI B,172Q *Z
040.102 303 107 040 JMF 040107A *CG
040.105 006 316 MVI B,316Q *N
040.107 076 201 MVI A,201Q *>
040.111 323 373 OUT 373Q *SC
040.113 076 100 MVI A,100Q *>@
040.115 323 373 OUT 373Q *SC
040.117 177 MOV A,A *-
040.120 170 MOV A,B *X
040.121 323 373 OUT 373Q *SC
```

ENTER STARTING ADDRESS: 042 074

```
042.074 104 MOV B,H *D
042.075 111 MOV C,C *I
042.076 123 MOV D,E *S
042.077 055 DCR L *-
042.100 070 DB 070Q *B
042.101 054 INR L *,
042.102 040 DB 040Q *
042.103 126 MOV D,M *V
042.104 105 MOV B,L *E
042.105 122 MOV D,D *R
```

Listing 2. Sample run of DIS-8 disassembling parts of itself. Note program's handling of string data. (The byte loaded into the B register in the first line had to be changed to meet the requirements of the terminal.)

ENTER STARTING ADDRESS: 2040

```
2040 06 7A MVI B,7AH ;Z
2042 C3 47 20 JMP 2047H ;CG
2045 06 CE MVI B,CEH ;N
2047 3E 81 MVI A,81H ;>
2049 D3 FB OUT FBH ;SC
204B 3E 40 MVI A,40H ;>@
204D D3 FB OUT FBH ;SC
204F 7F MOV A,A ;_
2050 78 MOV A,B ;X
2051 D3 FB OUT FBH ;SC
```

ENTER STARTING ADDRESS: 2229

```
2229 44 MOV B,H ;D
222A 49 MOV C,C ;I
222B 53 MOV D,E ;S
222C 2D DCR L ;-
222D 38 DB 38H ;B
222E 2C INR L ;,
222F 20 DB 20H ;
2230 56 MOV D,M ;V
2231 45 MOV B,L ;E
2232 52 MOV D,D ;R
```

Listing 3. DIS-8 sample run (hex version).


```

*
*      ASCII TO BINARY CONVERSION ROUTINE
*
BIN    SUI      30H      NO CHAR < '0'
      RC
      ADI      30H-47H    NO CHAR > 'F'
      RC
      ADI      6          A THRU F?
      JP      BINO      YES, BRANCH
      ADI      7          ':' TO '0' ILLEGAL
      RC
      ADI      10         ADJUST
      ORA      A          CLEAR FLAGS
      RET
--

```

```

*
*      GET STARTING ADDRESS
*
ADDR   LXI      H,0      CLEAR H,L
ADDR0  CALL     IN       GET ENTRY
      CALL     OUT      ECHO
      CFI      0DH      DONE?
      RZ
      CALL     BIN      IF SO, RETURN
      JC      ERR      CONVERT TO BINARY
      DAD      H        BAD ENTRY
      DAD      H        MOVE LAST ENTRY
      DAD      H        OVER 4 PLACES
      DAD      H
      DAD      H
      ORA      L        ADD LATEST ENTRY
      MOV      L,A      TO L REG
      JMP      ADDR0    GET ANOTHER ENTRY
--

```

Listing 4. Hex I/O routines (BIN, ADDR, PADDR, ASC).

```

*
*      PRINT ADDRESS
*
PADDR  MOV      A,H      GET ADDR HI BYTE
      LXI      D,BUFF
      CALL     ASC       PRINT IT
      MOV      A,L      GET LOW BYTE
      JMP      ASC       PRINT IT
--

```

```

*
*      BINARY TO ASCII CONVERSION ROUTINE
*
ASC     PUSH     PSW      SAVE BYTE
      RRC
      RRC          MOVE HIGH NIBBLE
      RRC          DOWN
      RRC
      ANI      0FH      STRIP LOW NIBBLE
      CALL     ASC0     CONVERT TO ASCII
      POP      PSW      RESTORE BYTE
      ANI      0FH      STRIP HIGH NIBBLE
      CALL     ASC1     CONVERSION ROUTINE
      STAX     D        PUT CHAR IN BUFF.
      INX      D
      RET
--

```

```

*
*      THE FOLLOWING ROUTINE CONVERTS A
*      4 BIT VALUE TO AN ASCII CHARACTER
*      (HEX NOTATION) IN ONLY 6 BYTES
*      (WHO SAYS THE 8080 AIN'T A GOOD
*      PROCESSOR?)
*
ASC1    ADI      90H      A TO F WILL CAUSE
      DAA          CARRY TO BE SET
      ACI      40H      ADD CARRY AND
      DAA          ADJUST
      RET
--

```

code in the table of mnemonics and inserts the appropriate mnemonic into the buffer. The data that follows two-byte instructions is then placed into its position in the mnemonic.

In the case of three-byte instructions, operation is similar, except the two bytes of data are reversed when placed in the mnemonic column so that the high byte will come first (the 8080 stores two-byte data low-high).

As an added touch, the letter Q is printed after single-byte data in the mnemonic column to designate octal; the letter A after two-byte data designates split octal. Comments are then printed as described earlier.

Operation is as foolproof as possible. After printing its title, DIS-8 asks for a starting address, which must be entered using split octal notation. The input routine will not accept any digit that is not an octal number, nor will it accept a byte greater than 377Q. An illegal entry will cause a question mark to be printed, and the input register will be cleared, requiring the user to start over.

Each byte entered must con-

sist of three digits, but for an address less than 1000A, only one byte is needed. A space is printed after each byte entered, and if more than two are entered, the last two are used as the starting address. The entry is terminated and disassembly starts when a carriage return is entered.

DIS-8 disassembles for ten lines and waits for a response. If an escape is entered, the user is asked for a new starting address. This makes it possible to follow jumps and calls in the program being disassembled. If any other key is pressed, disassembly continues at the current address.

Modifications

Even though the H8 and its software use an octal number system, I originally wrote DIS-8 with hexadecimal input and output, as shown in the sample run in Listing 3. If you prefer the hex version, the routines labeled BIN, ADDR, PADDR and ASC must be replaced with those shown in Listing 4.

In addition, the following changes must be made: BUFF + 9 to BUFF + 6
BUFF + 50 to BUFF + 40
BUFF + 25 to BUFF + 20
MVI A,2AH to MVI A,3BH
MVI A,51H and MVI A,41H to MVI A,48H
MVI D,54 to MVI D,44

DS 55 to DS 45.

The hex version's input routine will only accept valid hex numbers, and no leading zeros are required for addresses less than 1000H.

With patience and a little luck, you can decipher a machine-code program using DIS-8. I now have Control BASIC operating on a homemade ROM board in my H8. ■

The complete assembly source for DIS-8 (both versions) is available on cassette from the author for \$5, in Heath's TED-8 format.

Listing 1. DIS-8 disassembler for Heath H8.

```

*      DIS-8 (OCTAL VERSION)
*      AN 8080 DISASSEMBLER
*      FOR HEATH H8 COMPUTERS
*
*      WRITTEN BY PATRICK SWAYNE 11-11-78
*      REVISED 3-27-79
*      OCTAL VERSION WRITTEN 5-3-79
*
040.100  ORG      040100A
*
*      MINI CONSOLE DRIVER
*      FOR HEATH H8 COMPUTERS
*
040.100 006 116
040.102 303 107 040
*
MVI      R,116Q    FOR 1 STOP BIT
JMP      UART

```


Save more than 20%!

AMERICAN SQUARE COMPUTERS

**NORTH STAR—INTERTUBE—MICROTEK
ZENITH—HEATH—ITHACA
THINKER TOYS—GODBOUT—SOFTWARE**

The smartest computers at the smartest price.



FACTORY ASSEMBLED & TESTED	LIST	ONLY
HORIZON-1-16K-DOUBLE DEN KIT	SPECIAL \$1269	
HORIZON-1-32K-DOUBLE DEN KIT	\$1999	1575
HORIZON-2-32K-DOUBLE DEN KIT	2399	1879
HORIZON-1-32K-DOUBLE DEN	2695	2129
HORIZON-2-32K-DOUBLE DEN	3095	2435
HORIZON-2-32K-QUAD DENSITY	3595	2839
HORIZON-2-64K-QUAD + HARD DISK	9329	7229
HORIZON MEMORY 16K 389	32K 579	
NORTH STAR HARD DISK 10 MB	4999	3949
PASCAL FOR NORTH STAR ON DISK	199	190
Powerful NORTH STAR BASIC	The Best	FREE
2 NORTH STAR SOFTWARE DISKS w/HORIZON		FREE
NORTH STAR BUSINESS PROGRAMS & NORTHWORD	PHONE	
COLOR RAINBOW-2000 & CAT-100	PHONE	
ITHACA FRONT PANEL COMPUTER 64K	2885	2449
Z-8000 CPU CARD 16-bit ITHACA S-100	PHONE	
ITHACA MEMORY 8/16-bit	PHONE	
8086 CPU 16 bit 10x faster SEATTLE COMPUTER	PHONE	
SEATTLE COMPUTER MEMORY	PHONE	
SSM Z-80 CPU, VIDEO BOARD, MEMORY	PHONE	
MEASUREMENT MEMORY 64K A & T 4mHz	650	
JAWS MEMORY 64K A & T 4mHz	PHONE	
GODBOUT MEMORY—Static, Super Selection & Price		
THINKER TOYS DISCUS/2D A & T	1199	975
THINKER TOYS HARD DISK 26 Mb	4995	4149
DISCUS/2 + 2 1.2 Mbytes A & T	1545	1285
THINKER TOYS SUPERRAM	PHONE	
DELTA COMPUTER & DISK DRIVES	PHONE	
TARBELL COMPUTERS & DISK DRIVES	PHONE	
INTERTUBE II SMART TERMINAL	995	725
ZENITH-HEATH SMART TERMINAL Z-19 A & T		795



ZENITH COMPUTER-TERMINAL-DISK Z-89	2595	2195
CAT NOVATION MODEM	179	169
MICROTEK PRINTER	795	725
AXIOM PRINTER	795	695
ANADIX PRINTER	995	865
NEC PRINTER Fast Typewriter Quality	2915	2799
SECRETARY WORD PROCESSOR The Best!	85	77
TEXTWRITER III Book Writing Program	125	112
COFAST NORTH STAR BASIC Speeder Upper	79	71
PDS Super Z-80 ASSEMBLER & More	99	89
COMPILER FOR NORTH STAR \$150 w/PDS & HDS		90
EZ-80 MACHINE LANGUAGE TUTORIAL \$25 HDS		40
EZ-CODER Translates English to BASIC	79	71
ECOSOFT FULL ACCOUNTING PKG	350	315
THE SOURCE \$90.00 DATABASE CROSS ASSEMBLERS		CALL
BOX OF DISKETTES 29 IN PLASTIC CASE 30		FREE
Which Computers are BEST? BROCHURE		20
North Star Documentation refundable w/HRZ		
ORDER 2 or more COMPUTERS		BIGGER DISCOUNTS

FACTORY ASSEMBLED & FACTORY WARRANTY



**KIVETT DR
JAMESTOWN NC
27282
(919) 889-4577**

```

040.105 006 316      MVI      B,316Q      FOR 2 STOP BITS
040.107 076 201      MVI      A,201Q      SET UP B251
040.111 323 373      OUT      373Q
040.113 076 100      MVI      A,100Q
040.115 323 373      OUT      373Q
040.117 177          MOV      A,A          DELAY TACTIC
040.120 170          MOV      A,B          SET STOP BITS
040.121 323 373      OUT      373Q
040.123 076 025      MVI      A,025Q      ENABLE TRANSMIT
040.125 323 373      OUT      373Q      AND RECIEVE
040.127 303 162 040  JMP      DIS      READY TO
040.132 333 373      IN       373Q      RECIEVE CHAR?
040.134 346 002      ANI      2          NO, TRY AGAIN
040.136 312 132 040  JZ       IN       YES, GET IT
040.141 333 372      IN       372Q
040.143 346 177      ANI      177Q
040.145 311          RET
040.146 365          PUSH     PSW        SAVE ACC
040.147 333 373      OUT     OUT1       READY TO
040.151 346 001      IN       373Q      TRANSMIT CHAR?
040.153 312 147 040 ANI      1          NO, TRY AGAIN
040.156 361          POP      PSW        YES, RESTORE ACC
040.157 323 372      OUT     372Q      AND TRANSMIT
040.161 311          RET

```

MAIN PROGRAM

```

040.162 315 275 041  CALL     PLF
040.165 315 210 041  CALL     CLRBF
040.170 041 074 042  LXI      H,TITLE  GET TITLE
040.173 315 061 042  CALL     PSTRG   PRINT IT
040.176 315 275 041  CALL     PLF
040.201 315 275 041  CALL     PLF
040.204 041 115 042  LXI      H,ADDR   ASK START ADDR
040.207 315 061 042  CALL     PSTRG
040.212 315 320 041  CALL     ADDR   GET IT
040.215 315 275 041  CALL     PLF
040.220 016 012      MVI      C,10    10 LINE PAGE
040.222 315 275 041  CALL     PLF
040.225 315 007 042  CALL     PADDR  PRINT ADDRESS
040.230 106          MOV      B,M     GET INSTRUCTION
040.231 345          PUSH     H       SAVE ADDRESS

```

PROCESS 1, 2, AND 3 BYTE INSTRUCTIONS

```

040.232 041 001 052  LXI      H,TABL1  IS IT 2 BYTE
040.235 176          MOV      A,M     INSTRUCTION?
040.236 376 377      CPI      OFFH
040.240 312 253 040  JZ       DIS4    NO, CHECK IF
040.243 270          CMP      B       3 BYTES
040.244 312 323 040  JZ       DIS6    2 BYTE INST.
040.247 043          INX      H
040.250 303 235 040  JMP      DIS3
040.253 043          INX      H       IS IT 3 BYTE
040.254 176          MOV      A,M     INSTRUCTION?
040.255 376 377      CPI      OFFH
040.257 312 271 040 JZ       DIS5    NO, 1 BYTE
040.262 270          CMP      B
040.263 312 374 040 JZ       DIS7    YES, PRINT REST
040.266 303 253 040 JMP      DIS4    OF INSTRUCTION

```

SINGLE BYTE INSTRUCTIONS

```

040.271 341          POP      H       RESTORE ADDR
040.272 345          PUSH     H       SAVE AGAIN
040.273 021 173 042  LXI      D,BUFF+9 POINT TO BUFFER
040.276 176          MOV      A,M     GET BYTE
040.277 315 023 042  CALL     ASC     PUT IN BUFFER
040.302 315 114 041  CALL     MNEM   PUT IN MNEMONIC
040.305 021 244 042  LXI      D,BUFF+50 PUT * IN BUFF
040.310 076 052      MVI      A,2AH
040.312 022          STAX     D
040.313 023          INX      D
040.314 341          POP      H       RESTORE ADDR
040.315 315 243 041  CALL     COM2   PRINT COMMENT
040.320 303 056 041  JMP      PAGE   CK END OF PAGE

```

2 BYTE INSTRUCTIONS

```

040.323 341          POP      H       RESTORE ADDR
040.324 345          PUSH     H       SAVE AGAIN
040.325 021 173 042  LXI      D,BUFF+9 POINT TO BUFFER
040.330 176          MOV      A,M     GET BYTE
040.331 315 023 042  CALL     ASC     PUT IT IN BUFF
040.334 023          INX      D       SPACE
040.335 043          INX      H       NEXT BYTE
040.336 176          MOV      A,M
040.337 315 023 042  CALL     ASC     PUT IT IN BUFF
040.342 315 114 041  CALL     MNEM   PRINT MNEMONIC
040.345 341          POP      H
040.346 043          INX      H
040.347 176          MOV      A,M
040.350 315 023 042  CALL     ASC     PRINT NEXT BYTE
040.353 076 121      MVI      A,51H   OF 2 BYTE INST.
040.355 022          STAX     D       PRINT R
040.356 021 244 042  LXI      D,BUFF+50
040.361 076 052      MVI      A,2AH   PRINT *

```


SERIOUS READING

The Personal CHORGANIZER

Are you thinking about owning a personal computer but the thought of having to learn a lot of "greek" sounding words turn you off? Wish people could talk and write in plain English? Well, behold the *Chorganizer*. This book discusses just what most people expect a computer to do for them. It shows how to remove the drudgery from common chores. How? Through high-speed organization techniques — the very thing a computer is well suited to do. The *Chorganizer* will help you to learn how to save money, plan better, locate important facts quickly. This can lead to a better life-style for you. It will free you from laborious chores. What kind of chores, you wonder? Just to name a few, a computer can help you balance your checkbook, maintain a list of household valuables for inventory and insurance claim purposes, keep a list of monthly department store charges, record tax-deductible expenses by category for income tax purposes, and mail cards, invitations or notices to friends, members of a club, business associates, etc. Using a few simple commands and statements, and a data-base management program on your personal computer and your time can be spent on life's pleasures instead of day-to-day chores.

Only \$5.95 No. 87

SCELBI's Secret Guide to Computers

This book will turn you into a computer expert, quickly and easily. It explains the kind of computer found in most schools, small businesses and homes — the kind that has interactive BASIC. You'll learn BASIC, having fun every step of the way. The book explains how to deal with computer machinery, which buttons to press and trains you to write many kinds of programs. The author's "underground" style of writing is sure to hold your interest. The only way to learn BASIC programming is to look at sample programs, analyze them, and then invent your own. This book contains 150 sample programs that do just that. Charts are given comparing the different computers. Follow the four "secret" lessons of this book and you'll be programming a computer with confidence!

Just \$5.95 No. 93

Z80 Instruction Handbook

Your complete guide to the powerful Z80 instruction set. Machine codes are presented in both octal and hexadecimal format. A convenient index lists all instructions alphabetically along with machine codes and timing information. Industry standard mnemonics used throughout. Convenient pocket-sized edition.

Only \$5.95 No. 20

Introduction to Low Resolution GRAPHICS

What is "low resolution graphics"? It's graphics presented on a point-by-point basis where the number of points is limited to about 8000 or less. The APPLE II, TRS-80 and PET all have this capability and this publication will enable you to utilize your computer to the fullest. Consolidate data through graphics. Plot plain and simple, or fancy and complex, graphs for business. A computer presentation can improve impact by clarifying and amplifying the substance of the materials at hand. But if your interests lean more toward just having fun, this book will quickly show you the way. Learn to produce amazing computer graphics — even if you can't draw a line, literally! Master the basics of line & shapes, then on to drawing pictures, even creating animations! Produce a deck of playing cards... a clown that winks... or if you feel really inventive, try your hand at meshing your favorite illustration with synchronized, computer-generated sound. A new opportunity in programming awaits you — invest in *Introduction to Low Resolution Graphics*.

Just \$11.95 No. 65

Software Cookbooks — 6502, 6800, 8080, Z80

With the right SCELBI Gourmet Guide & Cookbook, you'll be able to put together programs without having to start from scratch. You'll have the most useful routines at your command — already programmed and ready-to-use. Features are search and sort routines, numerous examples of general-purpose utility routines, I/O and interrupt programming, control and manipulation of stacks, code and numeric conversion routines, flowcharts and source listings. Special listings include a presentation of machine codes (hexadecimal and octal notation included), and a reference guide to complete instruction set. All recipes are time tested. Tens of thousands of SCELBI's cookbooks have been used throughout the U.S. and in countries around the world.

No. 99 (6502) \$12.95; No. 50 (6800) \$12.95
No. 60 (8080) \$12.95; No. 75 (Z80) \$15.95

Learn Micro-Computers

A new multimedia information package for the beginner. Includes text from *Understanding Microcomputers* plus high-quality cassette. Covers all the basics quickly, easily and enjoyably. Companion tape includes chapter-by-chapter synopsis of the book. A great new idea for self-study.

Just \$14.95 No. 40

Take My Computer . . . Please!

An uproariously funny full length book about the true-to-life misadventures of well-known author Steve Ciarcia and his computer's inability to cooperate. Page after page of jollies and illustrations, too! Hardcover edition.

Just \$5.95 No. 35

Personal Information Management System

Increase your information management capabilities — use PIMS! In business you've got a personal stake in how information is managed because information is your key to success. PIMS will allow you to unleash the power of a microcomputer, to make it work for you! Use your computer for accounts receivable . . . accounts payable . . . maintenance of inventory records . . . to keep track of credit charges. Or, apply PIMS to personal chores and let it help you to improve your ability to plan . . . save money . . . locate important facts quickly. Specifics such as management of income tax deductions, department store charges, keeping track of personal disbursements, and more, can be managed through your computer. Let PIMS introduce you to a new way of living . . . enjoy a better life style, more happiness and freedom from drudgery of routine chores through the better command of information that PIMS can bring your way. Designed for computers such as the TRS-80, PET, etc., PIMS will give you the power to succeed in either the professional or personal arena, even without prior knowledge of programming. Easy-to-read manual and source listing included. Success is only as far away as your copy of PIMS!

Only \$11.95 No. 10

Understanding Microcomputers

If a basic understanding of microcomputer language has now become a necessity, help is here. *Understanding Microcomputers* offers its readers an education in microcomputer system information. The easy-to-read format assures quick comprehension for both the neophyte as well as the professional searching for business applications. This 300-page publication tells how to select a small computer system, introduces BASIC language programming, and illustrates BASIC instructions for almost every class of microprocessor. The convenient glossary covers all key terms.

Only \$9.95 No. 90

Calculating with BASIC

Here's a variety of programs in BASIC language to help the businessman, scientists and engineer. Shows how to apply the language to practical problems and equations. Formulas cover calculations of interest, payback periods, mortgage schedules, techniques for extending number of useful digits in monetary calculations using limited BASICs. A variety of electronic-applied formulas are programmed. The mechanics chapter covers resultant-force calculations, attractive forces due to gravity, projectile motion prediction and graphing, moments of inertia for T-section, I-section and channel sections. Mathematics chapter includes programs to solve the quadratic formula, general summation formulas such as sum of geometric progression, number conversion program, algorithms to compute sine, cosine, tangent, log e. For fun, games of Hangman and Space Capture are provided.

Only \$8.95 No. 30

Microcomputer Potpourri

A pocket-sized reference for the beginner. Data on all the popular chips. Pin connections, diagrams, distinguishing features. All the pertinent information is presented clearly and concisely. Also included is a glossary covering all the jargon. Full digest on understanding microcomputers.

Just \$3.95 No. 70

You'll appreciate a special quality of SCELBI books — A mark of excellence that's hard to find elsewhere. Books written authoritatively, yet in a style that is easy to read and with an appearance that makes reading them a pleasure. See SCELBI books at your favorite electronics or computer store or use this handy coupon and order direct. HP-85 users, ask about our new programs for that machine.

SCELBI Publication ✓ 281
20 Hurlbut St., Elmwood, CT 06110

IMPORTANT ORDERING INFO! Please include \$1 shipping/handling charges for each item. Prices shown are for North American customers. MC/VISA, Postal and Bank Money Orders preferred. Allow 4 weeks for delivery.

- | | | |
|---------------------------------|---------------------------------|---------------------------------|
| <input type="checkbox"/> No. 10 | <input type="checkbox"/> No. 20 | <input type="checkbox"/> No. 30 |
| <input type="checkbox"/> No. 35 | <input type="checkbox"/> No. 40 | <input type="checkbox"/> No. 50 |
| <input type="checkbox"/> No. 60 | <input type="checkbox"/> No. 65 | <input type="checkbox"/> No. 70 |
| <input type="checkbox"/> No. 75 | <input type="checkbox"/> No. 87 | <input type="checkbox"/> No. 90 |
| <input type="checkbox"/> No. 93 | <input type="checkbox"/> No. 99 | |

Name (print) _____

Address _____

City/State _____

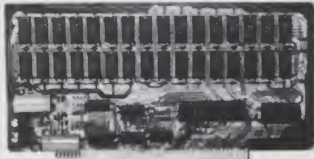
Zip Code _____

Card No. _____

Bank No. _____ Amt. Enc. _____

Signature _____

The days of complicated, unreliable, dynamic RAM are gone:



INTRODUCING JAWS

the ultrabyte memory board

\$199.95 (complete kit with 16K memory)

Netronics consistently offers innovative products at unbeatable prices. And here we go again — with JAWS, the ultrabyte 64K S100 memory board.

ONE CHIP DOES IT ALL

JAWS solves the problems of dynamic RAM with a state-of-the-art chip from Intel that does it *all*. Intel's single chip 64K dynamic RAM controller eliminates high-current logic parts . . . delay lines . . . massive heat sinks . . . unreliable trick circuits.

REMARKABLE FEATURES OF JAWS

Look what JAWS offers you: Hidden refresh . . . fast performance . . . low power consumption . . . latched data outputs . . . 200 NS 4116 RAMs . . . on-board crystal . . . 8K bank selectable . . . fully socketed . . . solder mask on both sides of board . . . designed for 8080, 8085, and Z80 bus signals . . . works in Explorer, Sol, Horizon, as well as all other well-designed S100 computers.

GIVE YOUR COMPUTER A BIG BYTE OF MEMORY POWER WITH JAWS — SAVE UP TO \$90 ON INTRODUCTORY LIMITED-OFFER SPECIAL PRICES!

UNDECIDED? TRY A WIRED 16K JAWS IN YOUR COMPUTER ON OUR 10-DAY MONEY-BACK OFFER (SPECIFY YOUR COMPUTER).

CONTINENTAL U.S.A. CREDIT CARD BUYERS DUTY SIDE CONNECTICUT CALL

CALL TOLL FREE 800-243-7428

From Connecticut Or For Assistance, (203) 354-9375

NETRONICS RESEARCH & DEVELOPMENT LTD.
333 Litchfield Road, New Milford, CT 06776

Please send the items checked below: Dept. K-8

- ☐ JAWS 16K RAM kit, No. 6416, \$199.95.*
- ☐ JAWS 16K RAM fully assembled, tested, burned in, No. 6416W, \$229.95.*
- ☐ JAWS 32K RAM kit, No. 6432, (reg. price \$329.95), SPECIAL PRICE \$299.95.*
- ☐ JAWS 32K RAM fully assembled, tested, burned in, No. 6432W, (reg. price \$369.95), SPECIAL PRICE \$339.95.*
- ☐ JAWS 48K RAM kit, No. 6448, (reg. price \$459.95), SPECIAL PRICE \$399.95.*
- ☐ JAWS 48K fully assembled, tested, burned in, No. 6448W, (reg. price \$509.95), SPECIAL PRICE \$449.95.*
- ☐ JAWS 64K RAM kit, No. 6464, (reg. price \$589.95), SPECIAL PRICE \$499.95.*
- ☐ JAWS 64K RAM fully assembled, tested, burned in, No. 6464W, (reg. price \$649.95), SPECIAL PRICE \$559.95.*
- ☐ Expansion kit, JAWS 16K RAM module, to expand any of the above in 16K blocks up to 64K, No. 16EXP, \$129.95.*

*All prices plus \$2 postage and handling. Connecticut residents add sales tax.

Total enclosed: \$

☐ Personal Check ☐ Money order or Cashiers Check

☐ VISA ☐ MASTER CHARGE (Bank No.)

Acct. No. _____ Exp. Date _____

Signature _____

Print Name _____

Address _____

City _____

State _____ Zip _____

☐ Send me more information

040.363 022
040.364 023
040.365 053
040.366 315 235 041
040.371 303 056 041

*
*
*

DIS7

040.374 341
040.375 345
040.376 021 173 042
041.001 176
041.002 315 023 042
041.005 023
041.006 043
041.007 176
041.010 315 023 042
041.013 023
041.014 043
041.015 176
041.016 315 023 042
041.021 315 114 041
041.024 341
041.025 043
041.026 043
041.027 176
041.030 315 023 042
041.033 053
041.034 176
041.035 315 023 042
041.040 076 101
041.042 022
041.043 021 244 042
041.046 076 052
041.050 022
041.051 023
041.052 053
041.053 315 227 041

*
*
*

PAGE

041.056 345
041.057 041 162 042
041.062 315 061 042
041.065 315 210 041
041.070 341
041.071 315 275 041
041.074 043
041.075 015
041.076 302 225 040
041.101 315 132 040
041.104 376 033
041.106 312 201 040
041.111 303 220 040

*
*
*

MNEM

041.114 041 251 042
041.117 176
041.120 270
041.121 312 137 041
041.124 043
041.125 176
041.126 376 004
041.130 302 124 041
041.133 043
041.134 303 117 041
041.137 043
041.140 021 213 042
041.143 176
041.144 022
041.145 043
041.146 023
041.147 176
041.150 376 010
041.152 314 175 041
041.155 376 007
041.157 314 175 041
041.162 376 006
041.164 314 175 041
041.167 376 004
041.171 302 144 041
041.174 311

*
*
*

SPACE

041.175 305
041.176 117
041.177 023
041.200 015
041.201 302 177 041
041.204 301
041.205 043
041.206 176
041.207 311

*
*
*

SPACE1

STAX D
INX D
DCX H BACK UP
CALL COM1 PRINT COMMENT
JMP PAGE CK END OF PAGE

3 BYTE INSTRUCTIONS

POP H RESTORE ADDR
PUSH H SAVE AGAIN
LXI D,BUFF+9 POINT TO BUFF
MOV A,M GET BYTE
CALL ASC PUT IT IN BUFF
INX D SPACE
INX H NEXT BYTE
MOV A,M
CALL ASC PUT IT IN BUFF
INX D
INX H
MOV A,M
CALL ASC 3RD BYTE IN BUFF
CALL MNEM PRINT MNEMONIC
POP H
INX H
INX H
MOV A,M
CALL ASC PRINT NXT BYTE
MVI A,41H PRINT LETTER A
STAX D
LXI D,BUFF+50
MVI A,2AH PRINT *
STAX D
INX D
DCX H
CALL COM PRINT COMMENTS

END OF PAGE CHECK

PUSH H
LXI H,BUFF PRINT CONTENTS
CALL PSTRG OF BUFFER
CALL CLRF
POP H
CALL PLF
INX H GET NEXT INST.
DCR C END OF PAGE?
JNZ DIS2 NO, CONTINUE
CALL IN YES, WANT TO
CPI 1BH CONTINUE?
JZ DIS0 NO, BEGIN PGM
JMP DIS1 YES, START PAGE

PRINT MNEMONICS

LXI H,TABLE LOOK UP OPCODE
MOV A,M IN TABLE
CMP B IS THIS IT?
JZ MNEM2 YES, PUT IN BUFF
INX H NO, GET NEXT
MOV A,M OPCODE
CPI 4
JNZ MNEM1
INX H
JMP MNEM0 TRY AGAIN
INX H SKIP OVER OPCODE
LXI D,BUFF+25 POINT TO BUFFER
MOV A,M GET FIRST CHAR.
STAX D PUT IT IN BUFF
INX D GET NEXT CHAR
INX H
MOV A,M
CPI 8 CHECK FOR SPACES
CZ SPACE
CPI 7
CZ SPACE
CPI 6
CZ SPACE
CPI 4
JNZ MNEM3 END OF MNEM.?
RET YES, RETURN

PRINT SPACES

PUSH B
MOV C,A NO OF SPACES
INX D "PRINT" A SPACE
DCR C END OF SPACES?
JNZ SPACE1 NO, CONTINUE
POP B YES,
INX H GET NEXT CHAR
MOV A,M
RET RETURN

CLEAR BUFFER

APPLE II* SOFTWARE

HOME FINANCE PROGRAM —

The most complete & concise home budgeting program for the Apple. Simply laid out & easy to use.

- 175 entries/12 categories per month or year
- Month-to-date, year-to-date summaries
- Classifies tax deductible expenditures
- Balances & reconciles checkbook. Specify if you have Apple II + *.

Price: \$39.95

OMNIBUS BANKING & FINANCIAL

PAK — A program designed to aid businesses & consumers in long or short range financial planning.

- Examines investments, savings & annuities, mortgages & loans; depreciation & amortization schedules & much more.

Price: \$59.95

TEXT PROCESSING SYSTEM — A true text editor & assembler. Create & edit integer, Applesoft* & Assembly language programs.

- Cumbersome line numbers are no longer needed
- Basic programs can be converted into text files, edited, then converted back
- Uses all 56 standard 6502 opcode mnemonics, plus 6 additional pseudo opcodes
- Includes 43 page manual.

Price: \$55.00

GAME DISK

TRY YOUR LUCK! Slots, roulette, craps & blackjack. (All odds listed).

DIET — Individually charts a total weight loss program & schedule

BIOHYTHM — Separate critical days listing with graph.

LONGEVITY — Based on medical statistics. How long will you live? Requires Applesoft.

Price: \$39.95

CHECKBOOK PROGRAM — Fast accurate checking account storage,

access, balancing, and trouble shooting. Requires Applesoft.

Price: \$29.95

DATA BASE MANAGER

- Selects information with full BOOLEAN logic
- Allows sifting of large data base into smaller working data base
- Designs input format or let you
- Sorts on any or all fields
- Lets file expand to occupy as many disks as you wish
- Allows rapid data entry in blocks for repeated data
- Requires Applesoft. Includes 12 page manual

Price \$50.00

DIGITAL MARKETING

2670 Cherry Lane
Walnut Creek, CA 94596
(415) 938-2880

*Apple II, Apple II+ & Applesoft are trademarks of Apple Computers, Inc.

```

041.210 026 066      * CLRBF      MVI      D,54      SIZE OF BUFFER - 1
041.212 041 162 042      * LXI      H,BUFF      H,BUFF
041.215 066 040      * CLRBI      MVI      M,20H      PUT SPACE IN BUFFER
041.217 043          *          INX      H
041.220 025          *          DCR      D
041.221 302 215 041      *          JNZ      CLRB1
041.224 066 004      *          MVI      M,4
041.226 311          *          RET

*
*
* PRINT ASCII COMMENTS
041.227 176      * COM      MOV      A,M      GET 1ST BYTE
041.230 315 244 041      *      CALL     COMA      PRINT IT
041.233 043          *          INX      H
041.234 023          *          INX      D
041.235 176      * COM1     MOV      A,M      GET BYTE
041.236 315 244 041      *      CALL     COMA      PRINT IT
041.241 043          *          INX      H
041.242 023          *          INX      D
041.243 176      * COM2     MOV      A,M      GET BYTE
041.244 346 177      * COMA    ANI      7FH      NO PARITY
041.246 365          *          PUSH     PSW      SAVE CHAR
041.247 326 137      *          SUI      5FH      SMALL LETTER?
041.251 372 261 041      *          JM      COMA1     NO
041.254 361          *          POP      PSW      YES, CAPITALIZE
041.255 346 137      *          ANI      5FH
041.257 022          *          STAX     D      PUT IT IN BUFF
041.260 311          *          RET
041.261 361      * COMA1     POP      PSW
041.262 365          *          PUSH     PSW
041.263 326 041      *          SUI      21H      CONTROL CHARS?
041.265 362 272 041      *          JP      COMA2
041.270 361          *          POP      PSW
041.271 311          *          RET
041.272 361      * COMA2     POP      PSW
041.273 022          *          STAX     D      PUT IT IN BUFF
041.274 311          *          RET

*
*
* PRINT CR AND LF
041.275 345      * PLF      PUSH     H      SAVE H,L
041.276 041 153 042      *          LXI      H,CRLF      GET CR, LF
041.301 315 061 042      *          CALL     PSTRG      PRINT THEM
041.304 341          *          POP      H      RESTORE H,L
041.305 311          *          RET

*
*
* ASCII TO BINARY CONVERSION ROUTINE
041.306 326 060      * BIN      SUI      30H      NO ENTRY < 0
041.310 330          *          RC
041.311 306 370      *          ADI      30H-38H      NO ENTRY > 7
041.313 330          *          RC
041.314 306 010      *          ADI      8      ADJUST
041.316 267          *          ORA      A      CLEAR ERROR FLAG
041.317 311          *          RET

*
*
* GET STARTING ADDRESS
041.320 041 000 000      * ADDR     LXI      H,0      CLEAR H,L
041.323 257      * ADDR0     XRA      A      CLEAR A
041.324 006 003      *          MVI      B,3      SET DIGIT COUNTER
041.326 117      * ADDR1     MOV      C,A      SAVE A
041.327 315 132 040      *          CALL     IN      GET CHARACTER
041.332 315 146 040      *          CALL     OUT     ECHO
041.335 376 015      *          CPI      0DH      DONE?
041.337 310          *          RZ
041.340 315 306 041      *          CALL     BIN      IF SO, RETURN
041.343 332 376 041      *          JC      ERR      CONVERT TO BINARY
041.346 201          *          ADD      C      BAD ENTRY
041.347 005          *          DCR      B      ADD PREVIOUS ENTRIES
041.350 312 364 041      *          JZ      ADDR2     3 DIGITS ENTERED?
041.353 027          *          RAL      YES, PROCESS BYTE
041.354 027          *          RAL      NO, MOVE ENTRY
041.355 027          *          RAL      UP THREE PLACES
041.356 332 376 041      *          JC      ERR      NUMBER TOO LARGE
041.361 303 326 041      *          JMP      ADDR1     GET ANOTHER ENTRY
041.364 145      * ADDR2     MOV      H,L      MOVE LAST BYTE UP
041.365 157          *          MOV      L,A      NEW BYTE IN L
041.366 076 040      *          MVI      A,20H      SPACE BETWEEN BYTES
041.370 315 146 040      *          CALL     OUT     SPACE BETWEEN BYTES
041.373 303 323 041      *          JMP      ADDR0     GET ANOTHER BYTE

*
*
* ERROR ROUTINE
041.376 041 147 042      * ERR      LXI      H,QUES      GET QUESTION MARK
042.001 315 061 042      *          CALL     PSTRG      PRINT IT
042.004 303 320 041      *          JMP      ADDR      TRY AGAIN

*
*
* PRINT ADDRESS
042.007 174      * PADDR     MOV      A,H      GET ADDR HI BYTE
042.010 021 162 042      *          LXI      D,BUFF      D,BUFF
042.013 315 023 042      *          CALL     ASC      PRINT IT
042.016 076 056      *          MVI      A,'.'      PRINT A PERIOD
042.020 022          *          STAX     D
042.021 023          *          INX      D

```


WE WILL NOT BE UNDERSOLD

16K MEMORY UPGRADE KITS

for TRS-80*, Apple II, Sorcerer (specify)

\$54

PRINTERS



NEC Spinwriter

Letter Quality High Speed Printer

Includes TRS-80* interface software, quick change print fonts, 55 cps, bidirectional, high resolution plotting, graphing, proportional spacing

\$2689

With Tractor Feed \$2889

DIABLO 1650

R.O. \$2890

KSR \$3285

779 CENTRONICS TRACTOR FEED PRINTER

Same as Radio Shack line printer I

\$969

737 CENTRONICS FRICTION & PIN FEED PRINTER

9 x 7 matrix

\$839

730 CENTRONICS FRICTION & PIN FEED PRINTER

7 x 7 matrix Same as Radio Shack line printer II

\$639

P1 CENTRONICS PRINTER

Same as Radio Shack quick printer

\$269

PAPER TIGER (IP440)

Includes 2K buffer and graphics option

\$939

TI-810 Faster than Radio Shack line printer III

Parallel and serial w/TRS-80* interface software

\$1575

with upper and lower case and paper tray

\$1665

OKIDATA Microline 80 Friction and pin feed

Tractor Feed, friction, and pin feed

\$559

EATON LRC 7000 + 64 columns, plain paper

\$349

ANADIX DP-9500

\$1389

CAT MODEM Originate and answer same as

Radio Shack Telephone Interface II

\$148

LEEDEX MONITOR Video 100

\$129

DISK DRIVES

\$314

More capacity than Radio Shack 35 Track (80 K Bytes) drives. Fully assembled and tested. Ready to plug-in and run the moment you receive it. Can be intermixed with each other and Radio Shack drive on same cable. TRS-80* compatible silver enclosure.

90 DAY WARRANTY. ONE YEAR ON POWER SUPPLY.

FOR TRS-80*

CCI-100 5 1/4", 40 Track (102K Bytes) for Model I

\$314

CCI-200 5 1/4", 77 Track (197K Bytes) for Model I

\$549

CCI-800 8" Drive for Model II (1/2 Meg Bytes)

\$795

For Zenith Z89

CCI-189 5 1/4", 40 Track (102K Bytes) add-on drive

\$394

Z-87 Dual 5 1/4" add-on drive system

\$995

DISKETTES — Box of 10 (5 1/4") — with plastic library case

\$24.95

8" double density for Model II (box of 10)

\$36.49

COMPLETE SYSTEMS

TRS-80* LEVEL II-16K with keypad

\$719

TRS-80* Expansion Interface

\$269

ZENITH Z89, 48K all-in-one computer

\$2595

ZENITH Z19

\$740

TELEVIDEO

912B \$745

920B \$769

ATARI 400 \$489

ATARI 800 \$799

T199/4 \$894

MATTEL INTELLIVISION

\$249

NORTH STAR Horizon 1

32K, Double Density

\$2129

DISK OPERATING SYSTEMS

PATCHPAK #4 by Percom Data

\$ 8.95

CP/M for Model I, Zenith

\$145

for Model II, Altos

\$169.00

NEWDOS Plus — with over 200 modifications

35track

\$ 89.00

and corrections to TRS-DOS

40 or 70 Track

\$ 99.00

SOFTWARE FOR THE TRS-80*

Software / Manual
w/Manual / Alone

CC-INVESTMENT PORTFOLIO MANAGER: This is what investors have been waiting for! This powerful program was developed by security analysts working with software designers. It comes on one cassette — 16K LEVEL II BASIC on one side, 32K DISK BASIC on the other. Store and report data. Review your portfolio. Produce detailed status, value, gain, and security analysis. Compare alternatives. **\$49.95/\$10**

INTELLIGENT TERMINAL SYSTEM ST-80-II BY LANCE MIKLUS: Enables a TRS-80* to act as a dial-up terminal on any standard time sharing network. Provides a TRS-80* with control key, ESC Key, Repeat Key, Rub Out Key, Break Key, full upper and lower case support, selectable printer output and program selectable transmission rates. **\$139/\$10**

CCA-DATA MANAGEMENT SYSTEM: Automate your information processing tasks. You can create a file of customer information; quickly and easily add, delete or update records; search a file; keep a file in order of the value in any field; and print records and labels in any desired sequence or from just a part of a file. Requires 32K TRS-80 and one drive. **\$74.95/\$10**

CSA-MAILIST SYSTEM: Creates, maintains and efficiently utilizes a name, address and telephone number file. 400 individual name/address entries can be maintained on a single density mini-floppy, and are manipulated directly by record number (direct access file method). Sorts can be performed, name + address combinations can be coded. Listing-directories and labels can be printed. A conversion facility is provided to convert most sequential name, address file formats into direct. Requires 32K TRS-80 and one drive. **\$49.95/\$10**

ACCESSORIES

HEAD CLEANING DISKETTE: Cleans drive Read/Write head in 30 seconds. Diskette absorbs loose oxide particles, fingerprints, and other foreign particles that might hinder the performance of the drive head. Lasts at least 3 months with daily use. Specify 5 1/4" or 8". **\$20 ea/\$45 for 3**

S & M SYSTEMS

INSEQ-80™: Indexed Sequential Access Method (ISAM) for the TRS-80 Model I. A must for anyone writing business programs. Eliminate wasted disk space from direct record processing. Split second access to any record. Access data records instantly via alpha/numeric "key" eg. Part NR, zip code or sequentially in ascending key sequence. Add/modify records in any order. Access up to three files per program — Files may be spread over multiple disks. Machine language processing from your basic program. Utility program to convert direct files to INSEQ-80 format. **\$49.95/\$10**

FULLY INTERACTIVE ACCOUNTING PACKAGE: ISAM (INSEQ-80) based. Includes General Ledger, Accounts Payable, Accounts Receivable and Payroll. System runs "stand alone" or "co-ordinated G/L" at users option. Based on Osborne accounting method. Requires 32K, TRS-80, 2 or 3 drives. N/A CA.

General Ledger \$99/\$10
Accounts Receivable \$99/\$10
Accounts Payable \$99/\$10
Payroll \$99/\$10
Osborne books: Req'd as additional documentation \$20 ea

INVENTORY Requires 32K, TRS-80, 1 drive **\$125/\$10**
INSORT-80: Callable form BASIC via USR. Sorts "Random" Disk Files. "Disk" to "Disk" sort times — 350 records in 35 sec, 1000 records in 6 minutes, 3500 records in 12 minutes. Machine language processing. Up to 35 sort keys ascending/descending. Utility to build BASIC program. Runs under NEWDOS. **\$49.95/\$10**

FLOPPY SAVER: Protection for center holes of 5 1/4" floppy disks. Only 1 needed per diskette. Kit contains centering post, pressure tool, tough 7-mil mylar reinforcing rings. Installation tools and rings for 25 diskettes. **\$11.95**
Re-orders of rings only: **\$ 7.95**

MICROSOFT

BASIC-80: Disk Extended BASIC. ANSI compatible with long variable names, WHILE/WEND, chaining, variable length file records. **\$325/\$25**

BASIC COMPILER: Language compatible with BASIC-80 and 3-10 times faster execution. Produces standard Microsoft relocatable binary output. Includes MACRO-80. Also linkable to FORTRAN-80 or COBOL-80 code modules. **\$350/\$25**

FORTRAN-80: ANSI 66 (except for COMPLEX) plus many extensions. Includes relocatable object compiler, linking loader, library with manager. Also includes MACRO-80 (see below). **\$425/\$25**

COBAL-80: Level 1 ANSI '74 standard COBAL plus most of Level 2. Full sequential, relative and indexed file support with variable file names. STRING, UNSTRING, COMPUTE, VARYING/UNTIL, EXTEND, CALL, COPY, SEARCH, 3-dimensional arrays, compound and abbreviated conditions, nested IF. Powerful interactive screen-handling extensions. Includes compatible assembler, linking loader, and relocatable library manager as described under MACRO-80. **\$700/\$25**

Z-80 SOFTCARD FOR APPLE: Your key to future software expansion. Get the best of both worlds, Apple's 6502 and CP/M Z-80. Plug in the card and get a Z80. Supports Apple language card and all Apple peripherals. Comes with set of three manuals. **\$339/\$75**

CCI-TELNET VERSION 5: A communication Package which enables microcomputer users to communicate both with Large Mainframes and other microcomputers. Extensive commands make it useful in many applications where communication between computers is necessary. Powerful terminal mode enabling user to save all data from a session on disk. Completely CP/M compatible. Multiple communication protocols supported. Able to transfer files in both directions without protocol where the other machine does not support any protocol. Extensive ON-SCREEN help. Source code provided. **\$149/\$15**

MICROPRO-WORD-STAR: Menu driven visual word processing system for use with standard terminal text formatting performed on screen. Facilities for text paginate, page number, justify, center and underscore. User can print one document while simultaneously editing a second. Edit facilities include global search and replace, Read/Write to other text files, block move, etc. Requires CRT terminal with addressable cursor positioning. **\$399/\$40**

BDS 'C' COMPILER: Supports most features of language, including structures, arrays, pointers, recursive function evaluation, and overlays. Package contains: compiler, linker, library manager; sample source files include games, a terminal emulator with disk I/O plus the source for many standard library functions; BDS C User's Guide, Book - The C Programming Language by Dennis Ritchie and Brian Kernighan. Requires at least 24K of RAM. **\$125/\$20**

CONFIGURABLE BUSINESS SYSTEM BY DMA: CBS is a data management system that allows true transaction processing. Custom accounting systems for payables, receivables, inventory control, order-entry, and general ledger can be set up without using any programming languages. CBS can be used to define an application such as an inventory control system by specifying master files to describe the inventory, customer and vendor files. Transaction files can then be used to describe activities such as purchases and sales. An extremely easy-to-use data entry program is used to enter information about customers, vendors, inventory, sales and purchases. After data entry is complete, an update program can process the transactions against the various master files, updating account balances and inventory quantities. The system features a screen menu generator and a comprehensive report generator which can be used to produce invoices, purchase orders, re-order reports, mailing labels or other special reports specific to the application. Good documentation and a demonstration inventory system supplied. Requires at least 48K memory. Does not require any support language. **\$295**

DEALER (NATIONAL/INTERNATIONAL) INQUIRIES INVITED

Send for FREE Catalogue

The CPU SHOP

✓ 256

TO ORDER CALL TOLL FREE 1-800-343-6522

Massachusetts residents call (617) 242-3361

For detailed technical information, call 617/242-3361

Hours: 10AM-6PM (EST) M-F (Sat. till 5)

*TRS-80 is a Tandy Corporation Trademark

5 Dexter Row, Dept. K8M
Charlestown, Massachusetts 02129

Massachusetts residents add

5% sales tax

Quantities on some items are limited



PET I/O Port Expander

*Series on enhancing the PET's capabilities continues
with a description of joystick interfacing.*

William F. Pytlik
9012 Maritime Court
Springfield, VA 22153

Many games and interactive computer programs can become more pleasant and efficient to use with the addition of joysticks. For complex, high-performance computers, a full range of freedom joysticks is appropriate; but for home computers, joysticks have four switches that move the cursor in four directions. These joysticks often do not provide a method to directly control the cursor in the diagonal direction.

Hardware

You can readily implement professional joysticks that control the cursor in a diagonal direction with the addition of four 100k Ohm potentiometers (Photo 1). These are readily available through many of the electronic magazine advertisers at approximately \$5 each.

You need a simple 3 x 4 inch printed circuit board to interface the joysticks via the "Expander"

(June 1980, p. 58) to the computer I/O port. Fig. 1 presents the full-size pattern of the printed circuit board. If the joysticks are wired as indicated in Fig. 2, the resistances in Table 1 will be observed at the four potentiometers of the joysticks.

The PET I/O port, when programmed for input, will essentially ignore a 100k Ohm input

and remain high (1). If the input is grounded, then the I/O port will recognize this as a 0. Consequently, peeking the input port will result in the decimal values shown in Table 2.

The joysticks can be housed in any case of appropriate size. I chose to use a 5 x 3 x 2 inch aluminum box. Photo 2 shows the completed joysticks. The switch

on the box is used as a "FIRE" button, useful for many games. Fig. 2 illustrates how these switches are tied into the joystick system. Essentially, when depressed, the switch brings all four inputs to the computer to ground (binary 0000 left, 0000 right or decimal 0 left, 0 right). Any program using joysticks as inputs and requiring a "FIRE" in-

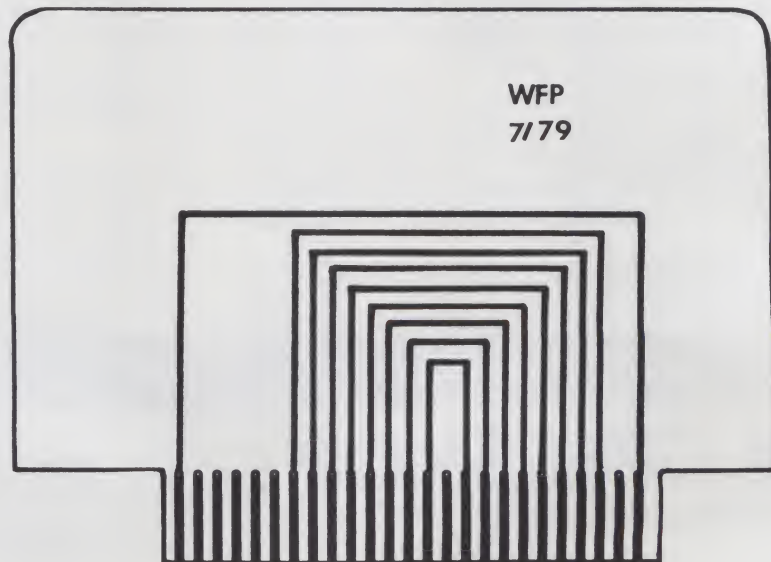


Fig. 1. Printed circuit board (full size).

Position (in degrees)	Resistance Potentiometer			
	1	2	3	4
0	100k	100k	100k	0
45	0	100k	100k	0
90	0	100k	100k	100k
135	0	0	100k	100k
180	100k	0	100k	100k
225	100k	0	0	100k
270	100k	100k	0	100k
315	100k	100k	0	0

Table 1.

dication would simply test for these values.

Software

Having completed the joysticks, you are now ready to enter Listing 1, which contains a simple BASIC program to maneuver two cursors across the screen and a children's game, called "YOU'RE IT." Although the program listing is self-docu-

Position (degrees)	Left Joystick	Right Joystick
0	224	14
45	96	6
90	112	7
135	48	3
180	176	11
225	144	9
270	208	13
315	192	12

Table 2.

2	—Joysticks w/four potentiometers
1	—6 foot DIN cable. Cut in half.
	D1-D4 — 1N914
	S1,S2 — N.O. MOM contact switch
	Misc. —Hardware, Aluminum Box, Wire

Table 3. Parts list.

menting, you should note that to eliminate wrap-around, change lines 3000-3050 and 4000-4050 to the lines in Listing 2.

The cursors defined in line

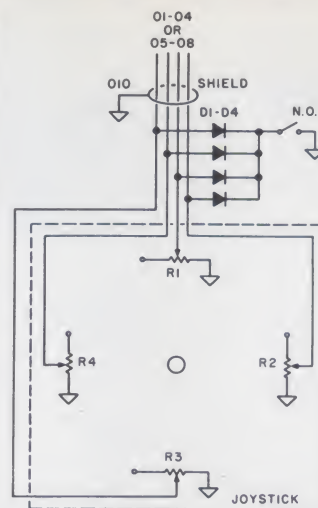


Fig. 2. Wiring the joystick.

1030 look the same. If different-looking cursors are required, different values must be poked to screen memory; a solid white cursor is screen value 160. To speed up cursor movement, the programs must be written in machine language. Additionally, the "FIRE" switch in this case could be used to change the

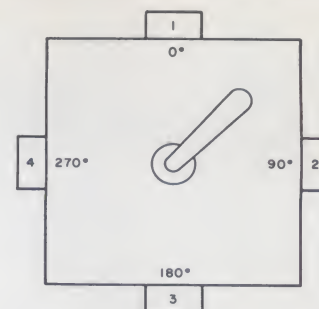


Fig. 3.

speed of cursor movement.

Conclusion

A joystick is invaluable for serious interactive computer work. The joystick controller in this article is more intricate than the video game joysticks, but less complex than those used on expensive computers. They are versatile and low in cost. The simple BASIC program presented in this article illustrates the simplest method to control the cursors via joysticks; the game, although very basic, provides hours of enjoyment for children. ■



Photo 1. Potentiometers used in the PET joystick.



Photo 2. Completed joystick.

Listing 1. Program for the joystick.

```

5 REM *** JOYSTICK ROUTINE ***
6 PRINT "J"
10 REM **OPEN USER PORT FOR READ**
20 POKE 59459,0
30 REM **INITIALIZE CURSORS**
40 XL=0:YL=0:XR=39:YR=24
50 GOSUB 1000
60 REM **LOOK AT LEFT JOYSTICK**
70 A=PEEK(59471) AND 240
80 REM **DETERMINE POSITION**
90 GOSUB 2000
100 XL=XL+X:YL=YL+Y
110 REM ** WRAP AROUND**
120 GOSUB 3000
130 REM **LOOK AT RIGHT JOYSTICK**
140 A=PEEK(59471) AND 15
150 REM **DETERMINE POSITION**
160 GOSUB 2000
170 XR=XR+X:YR=YR+Y
180 REM **WRAP AROUND**
190 GOSUB 4000
200 REM **DISPLAY CURSORS**
205 POKE Z,32:POKE Z1,32
210 GOSUB 1000
220 REM **GAME**
230 GOSUB 5000
240 GOTO 70
250 END

```


MARK GORDON COMPUTERS

DIVISION OF MARK GORDON ASSOCIATES, INC. ✓ 239

15 KENWOOD ST., CAMBRIDGE, MASSACHUSETTS 02139
(617) 242-2749 (617) 491-7505

COMPUTERS

Level-II 4K System.....	529.00
Level-II 16K System.....	659.00
Model-II 64K System.....	3499.00

DISK DRIVES

40 Track 5 1/4 inch drive.....	319.00
77 Track 5 1/4 inch drive.....	549.00
4 Disk Drive Cable.....	39.00

PRINTERS

Centronics 730.....	899.00
Centronics 779-2.....	999.00
Comprint 912p.....	599.00
Integral Data 440G.....	999.00
NEC 5510 w-tractor.....	2679.00
TI 810 Basic.....	1895.00

MISC HARDWARE

Expansion int. TRS-80(Ok).....	249.00
Novation Cat modem.....	159.00
16K Memory Kit.....	49.00
Leedex Monitor.....	109.00
Printer Cable for above.....	49.00
ISO-2 Isolator.....	54.00
AC LINE FILTER.....	24.00

STORAGE MEDIA

Verbatim-box 10-5 1/4.....	25.00
Memorex-box 10-5 1/4.....	22.00
Plastic Storage Box.....	5.00

OPERATING SYSTEMS

NEWDOS by APPARAT INC.....	49.00
NEWDOS+ by APPARAT INC.....	99.00
MMS FORTH DISKETTE-PRIMER.....	64.95

DISKETTE TRS-80*

BUSINESS SOFTWARE BY SBSG

Free enhancements and upgrades to registered owners for the cost of media and mailing. 30 day free telephone support. User reference on request.

Fully Interactive Accounting Package, General Ledger, Accounts Payable, Accounts Receivable and Payroll, Report Generating.

Complete Package (requires 3 or 4 drives)	\$475.00
Individual Modules (requires 2 or 3 drives)	\$125.00
Inventory II: (requires 2 or 3 drives)	\$ 99.00
Mailing List Name & Address II (requires 2 drives)	\$129.00
Intelligent Terminal System ST-80 III:	\$150.00
The Electric Pencil from Michael Shrayner	\$150.00
File Management System:	\$ 49.00

FINE PRINT

TRS-80 is a Tandy Corporation trademark. Use of above operating systems may require the use of Radio Shack TRS-DOS. Radio Shack equipment subject to the will and whim of Radio Shack.

ORDERING INFORMATION

We accept Visa and Mastercharge. We will ship C.O.D. certified check or money orders only. All orders must include 4 percent for shipping and handling. Massachusetts residents add 5 percent sales tax.

The Company cannot be liable for pictorial or typographical inaccuracies.

```

1000 REM *** PRINT CURSORS **
1010 Z=32768+(YL*40)+XL
1020 Z1=32768+(YR*40)+XR
1030 POKE Z,102:POKE Z1,102
1040 REM **102 IDENTIFIES THE CURSOR**
1050 RETURN
2000 REM *** IDENTIFY POSITION ***
2005 X=0:Y=0
2010 IF A=15 OR A=240 THEN RETURN
2020 IF A=224 OR A=14 THEN Y=Y-1:RETURN
2030 IF A=176 OR A=11 THEN Y=Y+1:RETURN
2040 IF A=112 OR A=7 THEN X=X+1:RETURN
2050 IF A=208 OR A=13 THEN X=X-1:RETURN
2060 IF A=96 OR A=6 THEN Y=Y-1:X=X+1:RE
TURN
2070 IF A=48 OR A=3 THEN Y=Y+1:X=X+1:RE
TURN
2080 IF A=144 OR A=9 THEN Y=Y+1:X=X-1:R
ETURN
2090 IF A=192 OR A=12 THEN Y=Y-1:X=X-1:
RETURN
3000 REM *** WRAP AROUND ***
3010 IF XL>39 THEN XL=0
3020 IF XL<0 THEN XL=39
3030 IF YL>24 THEN YL=0
3040 IF YL<0 THEN YL=24
3050 RETURN
4000 REM *** WRAP AROUND ***
4010 IF XR>39 THEN XR=0
4020 IF XR<0 THEN XR=39
4030 IF YR>24 THEN YR=0
4040 IF YR<0 THEN YR=24
4050 RETURN
5000 REM *** GAME ***
5010 IF Z=Z1 THEN 5050
5020 IF Z=Z1+1 OR Z=Z1-1 OR Z=Z1-41 OR
Z=Z1-40 OR Z=Z1-39 THEN 5050
5030 IF Z=Z1+39 OR Z=Z1+40 OR Z=Z1+41 T
HEN 5050
5040 GOTO 5060
5050 PRINT "YOU'RE IT!!!!":GOTO 250
5060 RETURN
READY.

```

```

3000 REM *** WRAP AROUND ***
3010 IF XL>39 THEN XL=39
3020 IF XL<0 THEN XL=0
3030 IF YL>24 THEN YL=24
3040 IF YL<0 THEN YL=0
3050 RETURN
4000 REM *** WRAP AROUND ***
4010 IF XR>39 THEN XR=39
4020 IF XR<0 THEN XR=0
4030 IF YR>24 THEN YR=24
4040 IF YR<0 THEN YR=0
4050 RETURN

```

Listing 2. Program modification.

Attention BARGAIN HUNTERS

Receive Hundreds of Classified Ads
Like These Every Month

HARD DISK DRIVE Diablo Mod 31 1.2 MByte std. density. Includes power supp. and cable, rack mount slides, amd manual. Excellent condition. \$450. Call 1601 2035

IMPACT PRINTER 165 CPS Serial and parallel interfaces-Eight Selectable character sizes-Single and double width characters-uses standard plain paper - same mechanism as the integral data system. 1 year old \$589. 2035

HEATHKIT H-11/DEC LSI-11 system, 32K Byte storage, reader 1 punch, video terminal, complete software. Cost \$4500 assembled, \$3500 kit. Like new. Sell for \$2250. 305-962-6677. 2058 Griffin Rd., Ft. Lauderdale, FL 33312.

FOR SALE: Interdata (Perkin-Elmer) 7/16 Mini with 32KB core, front panel, 50A PWR supply. Includes HS tape reader, interfaces for LP, 2 (TTY), and RS-232 (Full duplex, programmable). Includes manuals and much SW (Basic, Fortran, OS etc.,). \$800 - After 6 PM 2035

COMPUTER AUTOMATION ALPHA 16; 16 k-word core memory, RTC, PF-R. Modified Mod. ASR-33 TTY. Manuals, utilities, assemblers and many option boards - 16 bit I/O Driver, 16 bit I/O, Asynch modem contr. 64 bit output, 10 bit A/D - D/A. Fairly complete documentation. Up and running in Fortran. Not much more than TTY at \$1000. Herb Sauer, 303-494-8724.

FOR SALE: Heath H9 video terminal, excellent condition, \$175 or best offer. You ship. [214] 962-4484

WANTED: DIGITAL Group 32K memory board without memory chips and Phi deck controller board (kit, assembled or not working). 1510 NW 35th.

PET COMPUTERS moving up to LSI-11. Pet business system priced to sell. PET 2001-16N Computer \$800; 2040 Dual Floppy 340K (holds more data than 6 TRS-80 disks) \$1,100. Digital cassettes (2) \$60 each. System complete with Text Editor, disk sort, database software, real estate software and more \$2,100. Call PAUL (313)971-8447

COMPUTER SHOPPER, the new buy, sell, and trade publication, is ready to help you with the latest information on personal, small business and large-system computers, accessories and software.

Each ad-packed issue is full of bargains you are looking for. Included are ads from individuals throughout the United States who are selling their good, pre-owned equipment just so they can trade-up to new equipment coming on the market.

But, COMPUTER SHOPPER'S bargains won't be yours unless you subscribe. This useful, money-saving publication can become your way to communicate with other buyers, sellers, and traders all over the nation.

Whether you are a hobbyist or a part-time user, COMPUTER SHOPPER will put you in touch with the nationwide computer marketplace in time for you to take advantage of bargain opportunities.

Have something to sell? A COMPUTER SHOPPER subscriber probably wants to buy it.

Looking for a part, component or even a complete system? A COMPUTER SHOPPER subscriber probably wants to sell it.

COMPUTER SHOPPER is THE marketplace for anything in computers and is read by thousands of people who are ready to buy.

COMPUTER SHOPPER offers a unique format in which classified ads are categorized for fast location of specific items. Combining this with low individual ad rates — 10 cents a word —



makes it the ideal place for buyers and sellers to communicate. And, its mix of individual, dealer, and manufacturer ads enable subscribers to find what they want at the best price possible.

COMPUTER SHOPPER will work for you in other ways, too. If you are just thinking about getting into computers, it can help you learn product availability and prices before you make a decision. And, through the timely ads, COMPUTER SHOPPER will keep you abreast of changes in the market which could create bargain opportunities for you.

BUT COMPUTER SHOPPER cannot work for you unless you subscribe.

Want to look us over first? We'll give you your first issue FREE and then bill you for the next 12. If you are not convinced COMPUTER SHOPPER suits your needs, just write "cancel" on the invoice and return it.

And, to let COMPUTER SHOPPER start working for you right now, with a paid subscription we'll also give you a FREE classified ad to sell your pre-owned equipment or to find equipment you want.

If you don't need to use the free classified ad now, use it anytime during your subscription.

Subscription: \$10/year, 12 issues plus your first free one. Bank cards accepted. Money back guarantee.

The Nationwide Marketplace for Computer Equipment
COMPUTER SHOPPER
P.O. Box F20 • Titusville, Florida 32780
Telephone 305-269-3211

✓ 36

Slaying the 80-Column Dragon

The author/knight-errant searches this fair land and finds not one, but three honest manufacturers of 80-column boards for the Apple II.

Michael S. Tomczyk
418 Arguello Blvd., Suite 2
San Francisco, CA 94118

It's been said for a long time that whoever came up with an 80-column board for the Apple II would be a hero. During the fast few months, several groups of heroes have slain the 80-column dragon, and the implications for Apple II users are enormous.

There are three boards currently available, and more are on the horizon. First on the scene was Sup'R'Terminal from M&R Enterprises, followed closely by Doublevision from Computer Stop and Videoterm from Videx.

After using all three boards and meeting the various dragon-slayers, I still don't know which board is best. All three boards are more or less comparably priced (\$295-\$395), convert the Apple II display to 80 columns upper/lowercase, work with Pascal and the Apple BASICs and have different drawbacks, advantages and trade-offs.

Before the advent of these boards, you were confined to 40-column, uppercase displays on your Apple video monitor. But the standard typewriter page is 80 columns across, so how could you do word processing? How could you use Pascal, which is formatted for 80 columns? How could you access advanced time-sharing programs, all geared to 80 columns?

It was possible to do these functions, but with great difficulty. For example, you could print out 80 columns of upper/lowercase in-

formation, but you could only view 40 columns on your monitor. The new 80-column boards solve the problem, each in a slightly different way. To help sort out the differences between the boards, I've included a chart (see Table 1) showing their comparative features.

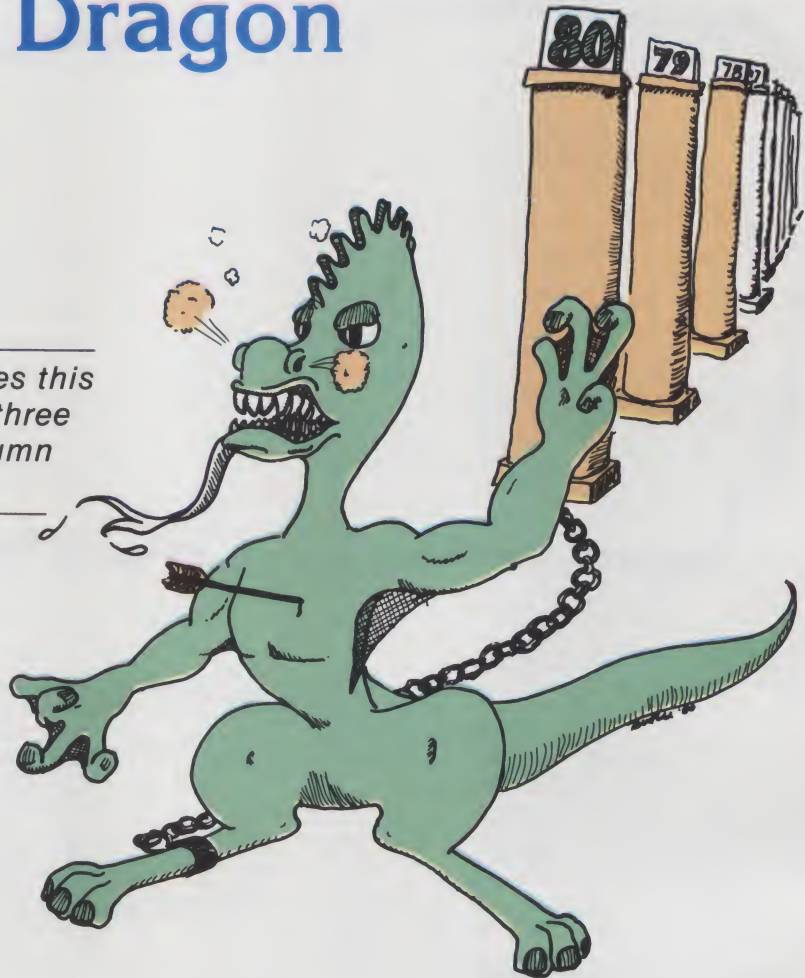
One of the best features of these plug-in boards is their compatibility with Pascal. You can now take full advantage of this versatile high-level language in the 80-column format it was originally intended for.

However, you have to use a video monitor—not a television set—to display the characters because with 80 columns you have to use smaller characters, which don't display well on a coarse-resolution television screen. If you use your Apple with a

television set, you have to buy a separate black and white video monitor to display 80 columns. Also, you can't use any of the 80-column boards with Apple's hi-res graphics or color.

Sup'R'Terminal

The largest of the three boards, the Sup'R'Terminal from M&R Enterprises, includes the most firmware and the most special features. The character set is excellent, with true descenders, and there are two ingenious adjustments *on the board* which fine-tune the monitor display. The video balance circuit (VBC) tones down the horizontal portions of individual letters (such as the top of the letter T) that are normally displayed much brighter than the ver-



Features	Sup'R'Terminal (M&R Enterprises)	Doublevision (Computer Stop)	Videoterm (Videx)
Price	\$395 (complete)	\$295 (incl. BASIC & PASCAL disks)	\$345 (board) \$12 (switchplate assembly)
Slot number Display quality	All three boards are slot-independent, but slot #3 is recommended, especially with Pascal Excellent—two board-based adjustments	Good	Display spills off screen, requires monitor adjustments Switchplate assembly available from Videx
Switching (between Apple monitor and board display) Compatible with	Manual (transfer video jack or use two monitors) Pascal, Apple BASICs	Manual (transfer jack or use two monitors) Pascal (with disk) Apple BASICs (with disk)	Pascal, Apple BASICs
Monitor	All three boards require video monitor instead of television set, although a crude display is possible using a television set with rf modulator		
Synchronous/asynchronous Light pen	Synchronous No (possibly in future)	Asynchronous Light pen connection (pen being developed)	Asynchronous Videx light pen connection and pen available
Power	Draws from both +5 V and +12 V power supplies	Draws from +5 V supply only	Draws from +5 V, -5 V and +12 V power supplies
Minimum configuration Firmware Phone modem Character set	Apple with 16K RAM 2K board-based D.C. Hayes compatible 128 character ASCII, 5 x 8 dot matrix, true descenders	Apple with 32K RAM and disk drive RAM-based software transparent to user D.C. Hayes compatible 128 character ASCII, 5 x 7 dot matrix, no true descenders	Apple with 16K RAM 1K board-based Testing 128 character ASCII, variable dot matrix, true descenders
Documentation	Excellent manual with helpful subroutines for special functions	Comprehensive user-oriented manual	Large spiral-bound manual including schematics and most thorough technical information
User-defined characters	Complete user-defined character sets, immediate access of up to ten fonts, easy instructions	Must change fonts or alphabets by replacing character generator chip	User-defined character (EPROM programmer needed or buy font EPROMs from Videx)
Graphics	Text and semi-graphics. Apple graphics and color must be displayed on separate screen, inhibits Apple color when used simultaneously	Text only. Apple graphics and color fully supported on separate screen	Pre-defined ROM-based graphics character set included, also user-defined EPROM graphics
Inverse mode	Yes, but Inverse character set must be defined	Normal Inverse	Resoldering required, permanent Inverse only
Shift (getting caps from lowercase mode)	CTRL A = single letter shift CTRL A CTRL A = shift lock (all caps) One wire shift modification converts shift key (how-to in manual) CTRL V will toggle modification off/on	ESC = single letter shift ESC ESC = shift lock (must exit lowercase to use normal ESC functions such as cursor moves) One wire shift modification converts shift key, CTRL E locks shift with modification	CTRL A = shift lock CTRL A = shift release (single letter capitalization not automatic, must enter and exit shift mode). New product modifies shift key to work normally
Cursor modes	Eight different cursor modes; fast/slow blink, underline, box, invisible cursor	User-definable cursor modes, up to 20 + combinations	User-definable cursor modes, up to 20 + combinations
Cursor movement	ESC ABCD/ESC IJKM	ESC ABCD/ESC IJKM but must exit to all caps mode (type CTRL E) to use ESC cursor controls	ESC ABCD/ESC IJKM
Tabs	No comma tab, requires special HTAB commands or POKE 36,n, where n = column number or GOTO XY CTRL I = 8 space tabbing	HTAB, comma tab problems (being solved); GOTO XY; POKE	No comma tab in INT BASIC, full comma tabs in Pascal; CTRL shiftN XY positions cursor
Screen display window	"Window Maker" commands define variable window display	Location-POKEs required	Location-POKEs required
Stoplist (interrupts scrolling)	CTRL-S	CTRL-S	—
Left bracket access	CTRL-K accesses left bracket	No	CTRL-K access
Warranty	90 days	90 days	90 days

Table 1. Comparative features of the 80-column boards for the Apple II.

tical part of the letter, especially on less expensive monitors. The VBC adjustment, coupled with an intensity dial and the monitor's own adjustments, produces a superior screen display, even on inexpensive monitors.

Sup'R'Terminal also has the most board-based RAM (3K), which permits user-defined character sets. You can define your own type fonts, scientific or mathematical notation sets or foreign alphabets—up to ten different character sets—and access them immediately. Excellent documentation shows clearly how to do this.

The only drawback is the lack of a full user-defined graphics feature. Because there is a one-dot gap between each character's dot matrix block, you can't, for instance, define a totally smooth graphic image. You have to settle for "semi-

graphics."

Another convenient feature is the "window maker," which lets you easily define a window of any size or shape on the screen, with everything displayed inside that window. You could put a "menu" or other reference system on one part of the screen, then use the scrolling window to run your programs. Normally you need a complex software package to do this.

Sup'R'Terminal is also the only board that is synchronous with Apple II. It uses Apple's internal timing system, so the board should run slightly faster than asynchronous boards.

I've heard several people claim that Sup'R'Terminal draws too much power and might overtax Apple's power supply. My own tests show that Apple's own plug-in boards draw more power from the 5 V power

supply provided than Sup'R'Terminal.

Apple II has a power problem that is not tied to any one board or group of boards. You run the risk of overtaxing the power supply if the total power drain of all the boards being used exceeds the specifications set down by Apple (see page 92 of the reference manual).

There are several combinations of plug-in boards and peripherals that can cause this problem, but, unfortunately, not all boards reveal how much power they use, so it's hard to determine when you're approaching the limit. The best interim solution is to unplug any boards you absolutely don't need when all the slots are filled in a fully configured system.

Doublevision

Doublevision from Computer Stop differs

from the other terminals in that it is software-based and uses disks to provide its features. The disk can be easily updated, or new features added (by Doublevision). You have to boot up the disk each time you turn on the board, and there exists the danger of damaging one of the disks and the possibility that eventually you'll use an advanced machine-level program that "clobbers" some RAM memory locations, although the chance of this happening is remote.

There are two disks included with the system—one for BASIC and one for Pascal. When using Pascal, the BASIC disk must be booted up first.

Doublevision's character set doesn't have true descenders, but the descenders print out normally on printers having true descender character sets. Incidentally, all three boards work well with thermal printers. I tested them with the Trendcom 200 and Apple's new Silentype, with good results.

Doublevision requires the use of the ESC key as a shift, which makes for fast typing. It is probably the fastest shift key to use, because you only have to hit one key; however, you have to exit the lowercase mode if you want to use any of the normal ESC functions, such as cursor movement.

Doublevision is the least expensive of the three boards (\$295) and provides excellent 80-column power at the lower end of the kilobuck range.

Videoterm

Like Doublevision, Videoterm by Videx created a lot of excitement when it was introduced at the Computer Faire. It offers the most technically well-documented manual of all the boards, although it seems a trifle weak in the explanation and use of board functions.

Because of the unique full-screen character set format, the display tends to spill off the screen around the edges and requires you to adjust the horizontal and vertical screen size controls, which are located *inside* most monitors. Videx claims their board works best with the Leedex monitor.

Videoterm also has an inexpensive (\$12) switchplate, which enables you to access either the Apple 40-column display or the Videoterm 80-column display on the same monitor simply by flicking a switch. For example, you can go back to the Apple display system for graphics without having to unplug the monitor from the board and plug it back into the Apple, which you have to do with Sup'R'Terminal and Doublevision.

By using a character set EPROM, you can

define your own character sets or graphics, although you need an EPROM programmer to do this. Videx conveniently sells a variety of predefined EPROMs that you can use to change fonts simply by substituting the EPROM chip.

Videoterm also has a pre-defined graphics set built into the system. The set essentially lets you do the line-drawing and is especially helpful if you want to create business forms or graphs. The documentation showing how to use this feature is clever.

The major drawback of the Videx board is its awkward shift command. The other boards provide a single-letter shift key that automatically shifts back down after execution. Every time you capitalize a single letter with Videoterm, you must type a command to get into the uppercase mode, then type another command to go to lowercase. However, Videx is already solving this problem with a new product: a PC board you substitute for one of the IC chips to convert the "old" Apple keyboard to the "new" keyboard. It turns the shift key into a normal shift key and provides a CTRL RESET function, with no special hardware modification. It can be used to convert any Apple.

With the other boards, you need a one-wire modification to convert the shift key to

SMALL SOFTWARE SYSTEM

PRODUCTS FOR THE TRS-80

SMALL SOFTWARE SYSTEM

NEW!

WHISTLER: HOME CONTROLLER INTERFACE - \$34.95. New hardware product that controls lights, appliances, computer peripherals, darkroom timers and other 115 volt devices anywhere in your house! Software controlled by cassette cable. Use with Sears or BSR Home Control System with ultrasonic option. Assembled, tested, self-contained, and includes Basic software.

TRS-80 DISK & OTHER MYSTERIES - \$22.95. H.C. Pennington. Best disk book we've seen! Directory secrets, file formats, damaged disk recovery, etc.

LEARNING LEVEL II - \$15.95. D.A. Lien. Learn Level-2 like you did Level-1, step by step. Same author and style as Level-1 manual. Super new book!

UTILITIES

RSM-2: MACHINE LANGUAGE MONITOR FOR 16K TRS-80'S - \$26.95
RSM-2D: THREE VERSIONS OF RSM-2 FOR DISK SYSTEMS - 29.95
RSM-2 RELOCATOR: PUT RSM-2/2D ANYWHERE IN MEMORY - 9.95

Machine Language monitors with Z-80 disassembler! HEX and ASCII memory dumps; EDIT, MOVE, EXCHANGE, VERIFY, FILL, ZERO, TEST, or SEARCH memory, read/write SYSTEM tapes, enter BREAKPOINTS, PRINT with TRS232 or Centronics, read/write disk sectors directly! RSM-2 tape loads at top of 16K LEVEL I or II; RSM-2D disk includes 3 versions for 16K, 32K and 48K.

DCV-1: CONVERT SYSTEM PROGRAMS TO DISK FILES - \$9.95. Execute Adventure, Air Raid, RSL-1, ESP-1, T-BUG, etc. from disk, even if they interfere with TRSDOS! New version works with TRSDOS 2.3.

BASIC-1P: LEVEL-1 BASIC WITH PRINTING! - \$19.95. Run any LEVEL-1 BASIC program on your 16K Level-2. PLUS LPRINT and LLIST with our TRS232 or Centronics. Furnished on tape; can be used from disk.

MACHINE LANGUAGE GAMES

AIR RAID, BARRICADE or RSL-1 - \$10.00 each, all 3 for \$25.00

AIR RAID: A super shooting gallery; our most popular game. Ground based missile launcher shoots high speed aircraft! Hours of fun!

BARRICADE: "BREAKOUT" for the TRS-80! Break through 5 walls with high-speed ball and keyboard controlled paddle! 96 different options!

RSL-1: Enter patterns with repeating keyboard! Save patterns on tape (4 furnished). Play John Conway's LIFE. FAST - about 1 second per generation!

SMALL SYSTEM SOFTWARE P.O. BOX 366 NEWBURY PARK, CA 91320

MODEL-II TRS-80

CP/M VERSION 2.0 FOR THE MODEL-II - \$170.00. Latest version from Digital Research. Runs both single and double density disks! "Standard" version runs nearly any CP/M software, including Cobol, Fortran, C-Basic, M-Basic, business and accounting packages, etc. Hundreds of programs available!

RSMII: ENHANCED RSM MONITOR FOR THE MODEL-II - \$39.95. Relocatable version of RSM-2D plus screen editor for modifying either memory or disk sectors in both Hex and ASCII, split screen scrolling, and formatted serial or parallel printing. Sold on self-booting disk; directions to save as TRSDOS file.

PROFESSIONAL SOFTWARE

THE ELECTRIC PENCIL FOR THE TRS-80: TAPE-\$99.95, DISK-\$150.00. Popular video editor for creating and saving text files. Prints formatted copy with right justification, page titling & numbering, etc. Upper case only, or lower case with modification. 16K Level-1 or 2 (tape).

CP/M OPERATING SYSTEM FOR THE MODEL-I - \$145.00. The 8080/Z80 "Software Bus for the Model-1 TRS-80. Includes TRS232 and RS-232-C software, lower-case support, debounce, DCV-2 and other unique utilities. Allows use of many available programs written for CP/M.

PRINTER SUPPORT

TRS232 PRINTER INTERFACE - \$49.95 (\$59.95 after June 30). Assembled & tested printer interface for RS232 or 20-mil current loop printers. Expansion interface not required. Print from Level-II BASIC, CP/M, BASIC-1P, ELECTRIC PENCIL, etc. Standard cassette software included. Add \$2.00 for shipping.

TRS232 "FORMATTER" SOFTWARE PACKAGE - \$14.95. Adds page and line length control, printer pause, "smart" line termination, etc. to TRS232.

RSM232: Adds RS-232-C capability to RSM-2/2D monitors - \$9.95
PEN232: RS-232-C for cassette version Electric Pencil - 9.95
EDT232: TRS232 and RS-232-C for tape version of EDTASM - 9.95

OTHER PRODUCTS FOR THE TRS-80

ESP-1: \$29.95. Assembler, Editor, Monitor (8080 mnemonics)
LS1-1: 8.00. Listing of Level-1 BASIC with some comments

**CP/M tm Digital Research, Inc. *TRS-80 tm Tandy Corp.
 ✓231 See your dealer or order direct. Calif. Residents add 6% tax

SMALL SYSTEM SOFTWARE P.O. BOX 366 NEWBURY PARK, CA 91320

a normal shift key used in ordinary typing. Sup'R'Terminal shows you how to make this modification in their manual, although this mod will void your Apple warranty. I suggest making this modification if you buy a Sup'R'Terminal or Doublevision, especially if you do a lot of word processing.

On the Horizon

Another 80-column Apple board I did not include in Table 1 was developed by Chuck Mauro, a 21-year-old Apple computer engineer who developed the board in his spare time and has recently started production.

The board uses Synertek's new 6545 chip, which provides a little extra capacity

and allows for some extra features, such as medium resolution (160 x 72 lines) vector graphics, which may be used simultaneously with text (in black and white). This asynchronous board provides normal functioning tabs and has an inverse mode and keyboard-controlled monitor switching (like Videoterm's switchplate, only you control from the keyboard).

Chuck's board, tentatively priced at \$360, will be sold through Apple dealerships under the corporate name "Sum Apple Software."

Outlook for 80-Column Boards

It's obvious that the makers of these

boards will be successful, because most Apple users want 80 columns and the special features described above. However, the market for these boards is not infinite. Apple III will definitely provide an 80-column format. Thus, while Apple IIs may continue to be sold, the market for 80-column boards will start falling off next year.

This means that the entrepreneur-engineer-inventors who are lauded today as mighty dragon-slayers will have to slay more dragons early next year to keep going. Most of the board designers I talked to are already working on new products, so keep an eye on these companies to see what happens. ■

DISK SORT MERGE 'DSM' FOR MOD I AND MOD II TRS-80™

FAST — Now you can sort an 85K diskette in less than 3 minutes* **— FAST**

Perfect for your multi-diskette RANDOM file mailing lists, inventory, etc. Ideal for specialized report generation. Sort, merge or combination. All machine language stand-alone package — Efficient and easy to use. No separate key files required! Physical records are rearranged on diskette! Supports multiple sub records per sector including optional sector spanning. Sorts on one or more fields — ascending or descending. Sort fields within records may be character, integer, and floating-point binary. Provides optional output field deletion, rearrangement, and padding.

*Sort timings shown below are nominal times. Times will vary based on sort and system configurations. Nominal times based on Mod I 48K 4-drive configuration, 64 byte records, and 5 sort keys.

TYPE	FILE SIZE (Bytes)	SORT TIME (Sec)	TYPE	FILE SIZE (Bytes)	SORT TIME (Sec)
SORT	16K	33	SORT	340K	1081
SORT	32K	49	SORT	680K	2569
SORT	85K	173	SORT and 85K SORT +		1757
SORT	170K	445	MERGE	1275K Merge	

DSM for Mod I (Minimum 32K, 2-drives) \$75 On-Disk

DSM for Mod II (Minimum 64K, 1-drive) \$150 On-Disk

Mod II Development Package \$100

Machine Language SUPERZAP, plus Editor/Assembler and Disassembler patches. (Include copy of Apparat NEWDOS + 5 1/4 diskette.)

Mod II Generalized Subroutine Facility 'GSF' \$50

∞ **BASIC** for Level II and Disk Systems **\$49.95**

∞ **BUSINESS** (Requires Infinite BASIC) **\$29.95**

COMPROC Command Processor for Disk Systems **\$19.95**

REMODEL + PROLOAD (Specify 16, 32, or 48K Memory) **\$34.95**

GSF (Specify 16, 32, or 48K) **\$24.95**

CHECK, VISA, M/C, C.O.D.
Calif. Residents add 6%
Telephone Orders Accepted
(714) 637-5016

RACET COMPUTES
702 Palmdale, Orange CA 92665

TRS-80 IS A REGISTERED TRADEMARK OF TANDY CORPORATION

SYSTEMS SOFTWARE

for

OHIO SCIENTIFIC to Emerson — MCB XPLO Compiler

XPLO is a fast mid-level language with many features similar to Pascal. It's a memory efficient compiler/interpreter that provides for convenient expansion with additional user defined functions. Available on cassette for \$75 (requires 16K) or 8" floppy disk for \$80 (requires 32K).

A/65 Assembler

A/65 is a fully disk-based 6502 assembler. This means there's practically no limit to the size program that can be assembled. A/65 accepts all standard MOS mnemonics and even prints a sorted symbol table for a great reduction in development time. Available on 8" floppy for only \$75.

TRACE

TRACE, a powerful machine language debugging tool, allows single-step and continuous tracing of machine code, including ROM. It displays all registers, complete processor status and mnemonic disassembly.

This package is a must for getting in and seeing how OSI's software works. TRACE includes a relocater so you can put it wherever you need it. Comes on 8" floppy for \$95.

PEGASUS SOFTWARE ✓ 160

P.O. BOX 10014, DEPT. K-1,
HONOLULU, HAWAII 96816 (808) 735-5013



TEXAS INSTRUMENTS TI-99/4 HOME COMPUTER

99/4 Console
List \$950.
Our Price **\$845.**

13" Color Monitor List \$450.
Our Price **\$419.**

PASCAL LANGUAGE SYSTEM

Our Price **\$438.**

10 Megabyte Corvus Drive **\$4,519.**



APPLE II COMPUTER™ Apple II (16K)

Our Price **\$974.**

Apple Disc II
w/Controller
Our Price **\$520.**

MICROPOLIS DRIVES

1041 - MOD II	LIST \$1045.00	OUR PRICE \$ 979.00
1043 - MOD II	LIST \$1145.00	OUR PRICE \$1069.00
1053 - MOD II	LIST \$1895.00	OUR PRICE \$1769.00
1021 - MOD II	LIST \$ 545.00	OUR PRICE \$ 509.00
1023 - MOD II	LIST \$ 645.00	OUR PRICE \$ 599.00
1033 - MOD II	LIST \$1395.00	OUR PRICE \$1299.00



ATARI PERSONAL COMPUTER SYSTEMS

Atari 400 (8K)

Our Price **\$499.**

800 (8K) Our Price **\$899.**

For Other Equipment Not Listed
Please Call For Our Special Price. (301) 336-7710

✓ 165 **SYSTEMS-GO**
SMALL COMPUTER SPECIALISTS

P.O. Box 146
Columbia, MD 21045

SPECIAL SUPER SAVINGS

NO CREDIT CARD ORDERS ACCEPTED

VERBATIM

MINI DISKETTES

FOR TRS-80, PET,
APPLE, HEATH

(Please specify which computer)

#P007XS

5 1/4" 10 PACK...ONLY \$24
Plus \$2.50 shipping & handling

FOR TRS-80 MOD II

#P015XS

8" 10 PACK.....ONLY \$36
Plus \$2.50 shipping & handling

**LEVEL II
16K
COMPLETE
LATEST
KEYBOARD, FULL
FACTORY WARRANTY
in factory carton . . .
NEW . . . \$690.00**

ORDER # TRS-001XISI . . . no
extra discounts . . . cashier's
checks, personal checks, or
money orders only . . . no
credit cards. See TRS TERMS
for shipping details.

**FREE with any
TRS-80 LEVEL II
or ACCESSORY
ORDER**

Your choice of any \$7.95
Instant Software Cassette
(See Instant Software ad for
list of programs.)

**SPECIAL SUPER SAVINGS
SALE PRICES GOOD THRU
COVER MONTH OF MAGA-
ZINE—OTHER Prices Sub-
ject to Change Without
Notice.**

MOM'S

MAIL ORDER MICROS ✓53

Dept 8KB • PO Box 427 • Marlboro NH
03455

Phone: (603) 924-3041*

**BRAND NEW* TRS-80's
and accessories at FANTASTIC SAVINGS**

LEVEL II 16K COMPLETE.....	\$690	#TRS-001XISI
16K EXPANSION UNIT.....	\$400	#TRS-002SISI
32K EXPANSION UNIT.....	\$525	#TRS-003ISI
DISK DRIVES (Specify which drive you want)		
\$425 each		#TRS-004ISI
FRICTION MODEL PRINTER.....	\$870	#TRS-005SISI
TRACTOR FED MODEL PRINTER.....	\$1350	#TRS-006ISI
LINE PRINTER III (AND CABLE).....	\$1750	#TRS-007ISI
MOD II 64K.....	\$3400	#TRS-008
MOD II 2 DISK DRIVE EXPANSION SYSTEM.....	\$1625	# TRS-00
PLUS FREE INSTANT SOFTWARE CASSETTE VALUE \$7.95 WITH ANY LEVEL II ORDER		

TRS TERMS: Shipment normally within one week of receipt of your order (with cashier's check, money order, or credit card) for microcomputer and three weeks for accessories (checks take two weeks extra to clear bank). ADD \$2.50 PER ITEM for HANDLING. Everything will be sent to you with UPS or other freight charges COLLECT. Sorry, no credit card purchases or extra discounts on TRS-80 items.

**NOT UPGRADED USED OR RECONDITIONED LEVEL I's WITH OLD KEYBOARDS BUT BRAND SPANKING NEW TRS-80's IN FACTORY CARTONS WITH FULL FACTORY WARRANTY! COMPARE PRICES AND QUALITY AND ORDER FROM MOM'S.*

*A registered trademark of Tandy Corp.

APPLE II

16K.....\$965 32K.....\$1040

PLUS FREE INSTANT SOFTWARE APPLE \$7.95 CASSETTE—YOUR CHOICE—
(SEE INSTANT SOFTWARE AD)

ATARI

MODEL 400.....\$490

MODEL 800.....\$775

#820 PRINTER.....\$445

#810 DISK DRIVE.....\$520

TERMS: Same as "TRS TERMS."
No extra discounts for Apple or Atari items

CAUTION

Our phone is usually answered
by machine. Orders taken with
credit cards. Questions
answered by mail. Please leave
your name and address clearly.

**TRS-80
MODEL II 64K**

\$3400⁰⁰

SEE TRS TERMS

MOM'S

MAIL ORDER MICROS ✓53

Dept 8KB • PO Box 427 • Marlboro NH 03455

Phone: (603) 924-3041*



SALE

5% EXTRA DISCOUNT

for orders with checks or money orders (see "TERMS" for details).

ITEMS THIS PAGE ONLY

ORDER NOW—

Prices subject to change without notice.

SCOTT ADAMS ADVENTURES

**SPECIAL 10% OFF
REGULAR PRICES**
(Reg \$14.95)

#1 ADVENTURELAND
YOU'LL WANDER THROUGH AN ENCHANTED LAND ENCOUNTERING WILD ANIMALS AND MAGICAL BEINGS WHILE YOU TRY TO RECOVER LOST TREASURES.
Order #SA001T for TRS Level II 16K.
#SA001S for Sorcerer 16K. #SA001A for Apple 24K—\$13.45 each, on cassette.

#2 PIRATE ADVENTURE
SAIL TO TREASURE ISLAND AND TRY TO RECOVER LONG JOHN SILVER'S LOST TREASURES.
Order #SA002T for TRS Level II 16K.
#SA002S for Sorcerer 16K. #SA002A for Apple 24K—\$13.45 each, on cassette.

#3 MISSION IMPOSSIBLE ADVENTURE
SAVE THE WORLD'S FIRST AUTOMATED NUCLEAR REACTOR WHEN YOU COMPLETE YOUR MISSION.
Order #SA003T for TRS Level II 16K.
#SA003S for Sorcerer 16K. #SA003A for Apple 24K—\$13.45 each, on cassette.

#4 VOODOO CASTLE
SAVE COUNT CRISTO FROM THE FIENDISH CURSE OR FOREVER BE DOOMED—BEWARE THE VOODOO MANT.
Order #SA004T for TRS Level II 16K.
#SA004S for Sorcerer 16K. #SA004A for Apple 24K—\$13.45 each, on cassette.

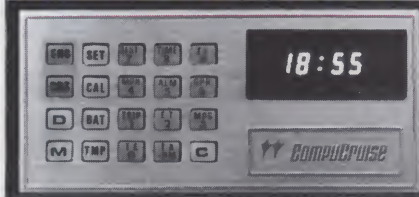
#5 THE COUNT
LOVE AT FIRST BYTE FROM YOUR BIG BRASS BED IN TRANSYLVANIA.
Order #SA005T for TRS Level II 16K.
#SA005S for Sorcerer 16K. #SA005A for Apple 24K—\$13.45 each, on cassette.

#6 STRANGE ODYSSEY
YOU'RE MAROONED AT THE GALAXY'S EDGE AND DISCOVER RUINS OF AN ANCIENT ALIEN CIVILIZATION AND TRY TO COPE WITH UNEARTHLY TECHNOLOGIES WHILE YOU AMASS FABULOUS TREASURES.
Order #SA006T for TRS Level II 16K.
#SA006S for Sorcerer 16K. #SA006A for Apple 24K—\$13.45 each, on cassette.

#7 MYSTERY FUN HOUSE
FIND YOUR WAY THROUGH THE STRANGEST FUN HOUSE BEFORE THE WEIRD PARK CLOSES.
Order #SA007T for TRS Level II 16K.
#SA007S for Sorcerer 16K. #SA007A for Apple 24K—\$13.45 each, on cassette.

#8 PYRAMID OF DOOM
AN EGYPTIAN TREASURE HUNT THROUGH A NEWLY UNCOVERED PYRAMID. COMPLETE WITH AN OMENT CURSE.
Order #SA008T for TRS Level II 16K.
#SA008S for Sorcerer 16K. #SA008A for Apple 24K—\$13.45 each, on cassette.

If you enjoy driving, you're going to get a **COMPUCRUISE**. Once you see what it can do, you just won't be able to live without it.



COMPU CRUISE

MODEL # 41

\$127.95

This gadget fits into most dashboards... no strain even in a tiny sports car like the Mazda RX-7... and once you have it, every trip is like flying a 747. The darned thing tells you the time, how fast you're going, how far you've been on this trip or since the last regassing, how many miles per gallon you're getting, either at the instant or the average on the trip... or gallons per hour at the moment or for the trip... temperature outside... inside (or coolant temperature, if you prefer)... oh, it has an elapsed time for the trip, a stop watch, lap time, an alarm... how much further for your trip, how many gallons more the trip will take, how much longer for the trip at your present average speed... yes, it gives you your average speed for the trip. You prefer it in metric, no strain... liters remaining, etc. Did we mention that it also has cruise control either at a speed set on the control board or at whatever speed you are traveling? The CompuCruise will keep you busy and entertained during any trip... telling you more than you will ever want to know.

The CompuCruise is not difficult to install... though it does connect to everything except the cigarette lighter. Until you've tried computerized travel, you haven't found out how much fun driving can be. It will work on any car not having fuel injection... and there is a front-wheel drive accessory gadget available for only \$4.40-#P001 (regularly \$5.50).

The price for the CompuCruise is regularly \$199.95... and a bargain at that price. We'll sell you one of these fantastic gadgets for \$159.95 with cruise control (Model 44-#P002), and \$127.95 without (Model 41-#P003). Send money... and start having fun!

CASIO'S NEW C-80 CALCULATOR CHRONOGRAPH



has lightweight attractive ruggedly built black plastic water-tight case and band, regular digital watch features of hours, minutes, seconds, AM/PM and day on display PLUS two time zones, calendar and a 4 function calculator! You've seen it advertised in the Wall Street Journal for \$75... MOM's price is only \$49.95. Hurry our supply is limited... order #PC80 now.

WAMECO S-100 Bare Computer Boards

		Retail	MOM'S Price	
10 ea	CPU-1	26.95	22.95	#LP001
10 ea	MEM-1A	25.95	21.95	#LP002
10 ea	Mem-2	26.95	22.95	#LP003
10 ea	EPM-2	25.95	21.95	#LP004
10 ea	EPM-1	25.95	21.95	#LP005
10 ea	RTC-1	23.95	20.50	#LP006
10 ea	QM-9	30.95	26.50	#LP007
10 ea	QM-12	34.95	29.95	#LP008
5 ea	FDC-1	42.95	36.95	#LP009
7 ea	FPB-1	44.50	37.95	#LP010
1 ea	EPM-1	49.95	42.50	#LP011
	8080 CPU Board			
	8K Memory Board (2102)			
	16K Memory Board (2114)			
	2708/2716 EPROM Board			
	1702 EPROM Board			
	Real Time Clock			
	The Little Mother (9 slot)			
	The Quiet Mother (12 slot)			
	Floppy Disk Board			
	Front Panel IMSAI size)			
	1702 EPROM Board (asmbld) without EPROMS			

BOOK CLEARANCE 50% OFF OR MORE!

How To Buy And Use Minis And Micros (Sams-publisher) #BK 1025—was \$9.95 now \$5.
How To Program Microcomputers (Sams-publisher) #BK 1027—was \$9.95 now \$4.50.
8080A Bugbook (Sams-publisher) #BK1103—was \$9.95 now \$5.
Understanding Microcomputers (Scebi-publisher) #BK1079—was \$8.30 now \$4.
Your Own Computer (Sams-publisher) #BK1072—was \$1.95 now \$1.
Underground Buying Guide (PMS-publisher) #BK1067 was \$5.45 now \$2.50.
Periodical Guide 1976 (Berg-publisher) #BK1041—was \$3 now \$1.50.
Periodical Guide 1977 (Berg-publisher) #BK1042—was \$3 now \$1.50.
Compulater Book (Tab-publisher) #BK1012 —was \$7.95 now \$4.

ASK MOM

For details of October 1980 Asian and European Electronics Tours. See January Wayne Green editorials in Kilobaud Microcomputing and 73 Magazine. Info #002... No charge.

HONEYWELL

Honeywell ASR-33 Communications Consoles with TTY, paper tape reader and punch. Used, working when removed from service. Shipped freight collect or you pick up. Weight 300 lbs. \$325. Order #P006X.

COMPUCOLOR HARDWARE

Compucolor Computer 8001 (use as computer or 75 MHZ Color Monitor)—8K RAM, BASIC and DOS in ROM, good condition. #S025X-\$1200 each. SPECIAL PRICE.
Compucolor MiniFloppy—5 1/4 inch, good condition. #S026X-\$475 each. SPECIAL PRICE.
Compucolor 8K RAM card—Static RAM, good condition. S027X-\$180 each. SPECIAL PRICE.
Compucolor Floppy Tape Drive—Uses eight-track cartridges, good condition. #S028X-\$55 each. SPECIAL PRICE.

MAGIC LIGHT BULB SAVER

If you've got a light bulb you need our MAGIC L.B.S. which increases the life expectancy of a new bulb 93 times!... and saves you 44% on energy costs. Regularly \$2.50... MOM's price is \$1.99 each. #LS001.

PANASONIC TAPE DECKS

Panasonic RS261 US Stereo Cassette Decks—with auto-stop, record level adjust, VU meters, used condition; all have had heads replaced and aligned. #T001-\$50.

PROCESSOR TECH SOFTWARE

Processor Tech Extended Disk BASIC—This is full disk BASIC on 8" disk for HELIOS II disk controllers with PTDOS and greater than 16K. #D015S-\$70 each.
BASIC 5 from Processor Tech—This is a simple BASIC for a SOLOS, CUTTER, or CONSOL Monitor and 8K of RAM. #D013-\$11.60 each.
Processor Tech GAMEPAC for above BASIC—Various simple games. #D014-\$10.00 each.

TDL SOFTWARE-DISK

TDL FDO5 & SuperBASIC on 8" Disk—This requires an ICOM Disk Controller and at least 20K of memory, plus a ZAP-LE Monitor in an S-100 Cabinet (Altair, IMSAI, etc.) #D0065X-\$120.
TDL System Software on 5 1/4" disk—This set of system software requires a North Star Disk Controller, and a TDL Systems Monitor Board I, and consists of 12K BASIC, Relocator/Linking Loader, Z-80 Editor, and Text Processor. #D0066X-\$160.
TDL System Software on 5 1/4" disk—This is the same as above, but does not require the Systems Monitor Board I. #D0067X-\$180.
TDL System Software on 5 1/4" disk—Again, as above, but requires a HELIOS Disk Controller and the TDL Systems Monitor Board II (not I). #D0068X-\$160.

VECTOR GRAPHIC S-100

Vector Graphic ROM/RAM card—12K empty ROM sockets, 1K RAM, excellent condition. No documentation. (Make offer—we may surprise you and accept!) #D0078X-\$95.

HEAD ALIGNMENT KIT

Best cassette recorder tape head alignment kit available. Solves loading problems. #K001-only \$9.95.

PROCESSOR TECH SOL

SOL Computers—8K RAM Monitor, S-100, excellent condition. #D004X-\$850.00 each.
TREK-80 on cassette for SOL—This is one of the best real time space games available today; needs 8K. #D005X-\$9 each.

TERMS: EXTRA 5% DISCOUNT ALLOWED ONLY ON ORDERS ACCOMPANIED BY CASHIERS CHECK, PERSONAL CHECK OR MONEY ORDER. NO C.O.D.'S PLEASE. ADD \$2.50 FOR HANDLING FOR ORDERS UP TO \$50.00—ALL OTHERS ADD 5% (WE REFUND EXCESS). WE SHIP UPS OR INSURED MAIL IF POSSIBLE. WE ACCEPT MC, VISA OR AMEX.

Graphics Character Generator

You can mix text and graphics anywhere on your Apple II screen with this CHAR-GRAF program.

Robin B. Moore
Warner Hill Rd., RFD #5
Derry, NH 03038

One of the nicest features of the Apple II computer is its high-resolution bit-mapped graphics display mode. It can be used for graphs, plots, digitized photographs or colorful, arcade-quality video games. Its only significant limitation is its inability to fully mix text and graphics.

Normally, text is assigned only to the bottom four lines of the screen in the hi-res graphics mode. This is not hard to live with, but it would be nice to mix text and graphics anywhere on the screen. Another improvement is the addition of lowercase and user-definable characters.

These two minor changes would create a machine with video display flexibility unmatched in the current personal computer market. There is nothing to prevent the Apple from displaying text on the hi-res screen. It simply isn't programmed to do so!

The Program

CHAR-GRAF is a package of assembly-language software that will allow you to add the following features to your Apple II:

- Fully mixed text and graphics in hi-res mode.
- Lowercase and uppercase characters.
- User-definable scientific and game characters.
- Multiple resident character sets.
- An invert the hi-res screen function.

These can be added without hardware changes. It will take a little time to type all the code into your Apple, but you will only have to do it once.

I designed CHAR-GRAF to be as compatible with existing Apple software as possible. It resides in lower memory along with the Apple II hi-res graphics routines that are provided by Apple as the first part of the hi-res demo tape. Its operation requires the presence of these routines. (If you are using the routines in the Programmer's Aid #1 ROM, also from Apple, CHAR-GRAF will require only minor changes.)

Printing text onto the hi-res screen with CHAR-GRAF is accomplished using normal PRINT statements. Text is displayed in the same 5 × 7 dot matrix format that is normally used by the Apple and will appear on the screen in its normal positions. VTABs and TABs will work as they normally do, as will user-defined scrolling windows.

In its present implementation, CHAR-GRAF will not scroll the hi-res screen, nor will it exhibit any response to the normally used screen clearing functions,

*Listing 1. Assembler source code for the CHAR-GRAF routines. This listing was created using the Microproducts assembler for the Apple II (which I have since abandoned, for many reasons). Base page symbols are shown preceded by an *. If you have an assembler, you can reassemble CHAR-GRAF to reside anywhere you want in memory.*

```

0010 * TITLE: CHAR-GRAF V1.3 *
0020 *****
0030 *
0040 * CHAR-GRAF V1.3 *
0050 *
0060 * SOFT CHARACTER GENERATOR *
0070 * ROUTINES FOR THE APPLE II *
0080 *
0090 * LINKS TO BASIC VIA CSWL,H *
0100 * FOR AUTO ARGUMENT PASSING *
0110 *
0120 * COPYRIGHT 3/1/1979 BY *
0130 *
0132 * ROBIN B. MOORE *
0133 * WARNER HILL RD. RFD # 5 *
0134 * DERRY, N.H. 03038 *
0135 *
0140 * ALL COMMERCIAL RIGHTS *
0142 * RESERVED *
0150 *
0160 *****
0170 *
0180 *
0190 * LOCATION EQUATES *
0200 *
0210 *
0215 DCOL DL 001C SHAPEDRAW COLOR
0220 TPL DL 001E TABLE PTR L
0230 TPH DL 001F " " H
0240 WNDW DL 0021 WINDOW WIDTH
0250 CH DL 0024 CURSOR HORIZ
0260 GBSL DL 0026 HIRES BASE ADDL
0270 GBSH DL 0027 " " ADDH
0280 BASL DL 0028 TEXT BASE ADDL
0290 BASH DL 0029 TEXT BASE ADDH
0300 IFLG DL 0032 INVERSE FLAG
0310 CSWL DL 0036 CONSOLE PTR LO
0320 CSWH DL 0037 " " HI
0322 AIL DL 003C ADD PTR LO
0324 AIH DL 003D " " HI
0330 XSAV DL 0045 SAVED X-REG
0340 YSAV DL 0046 " " Y-REG
0350 CSAV DL 0047 SAVED CHAR CODE
0360 SFLG DL 0048 STRIKEOVER FLAG
0365 HCOL DL 032C PLOT/LINE COLOR
0370 PAGE DL 032E HIRES PG 20/40
0380 TABL DL 0330 TABLE BASE ADDL
0390 TABH DL 0331 TABLE BASE ADDH
0400 COUT DL DF00 APPLE OUTPUT
0410 *
0420 *
0430 * LINK IN AND INITIALIZE *
0440 * IN BASIC, CALL 2048 *
0450 *
0460 * OR 0800 *
0470 LINK PHA
0480 LDA 08 SETUP CSWL,H
0490 STA *CSWH TO LINK THRU
0500 LDA 0F CGRAF ROUTINES
0510 STA *CSWL
0520 LDA 0FF DISABLE STRIKE-

```


which must be accomplished manually through the use of TABs, VTABs and the hi-res screen clear functions. Limited areas may also be cleared by simply moving the cursor to the desired position and printing blanks.

These limitations are unfortunate, but after my experience writing the demo program and the Character Set Editor, I've found that they are not difficult to deal with. It is also easy to simulate the Apple's normal flashing cursor in hi-res mode.

In part payment for the missing scroll and screen clear

functions, I've added a few new ones. With a CALL to INVSCRN (2187), you can inverse-video the entire hi-res screen and also complement the current text mode and hi-res color. A CALL to STRIKEOVER (2180) will set CHAR-GRAF into strike-over mode, causing its output to be ORed to the screen instead of overwriting as it normally would.

Also, I have added a pseudo-CHR\$ function. If you POKE an ASCII character code + 128 into CHARLOC (71) and then CALL CHARDRAW (2172), the equivalent character will be

printed at the current cursor position.

How CHAR-GRAF Works

Whenever text is output by the Apple, control is passed to the output routine whose address is stored in two base-page locations called CSWL and CSWH (\$36,37). Normally, this is the video output routine in the monitor ROMs. When CHAR-GRAF is in use, these pointers are changed to point to the entry address of its text output section. This is done easily from BASIC with a CALL LINK (2048).

The CSWL, CSWH pointers may be reset to their normal values with a PR#0 command, which will turn off CHAR-GRAF. You will need to do a TEXT command to take the Apple out of hi-res mode if you wish to see any further text output.

To allow CHAR-GRAF to use a number of different character sets at once, there is another pointer set, TL and TH (816, 817). These point to the beginning of the character set currently in use.

Changing character sets is done by changing these pointer

```

0530 STA *SFLG OVER MODE.
0540 PLA
0550 LRTS RTS RETURN
0560 : *
0570 : *
0580 : * CHARACTER GENERATOR
0590 : * ROUTINES FOLLOW.
0600 : *
0610 : * ENTRY AT CHAR ( $80B )
0620 : * SAVES ALL REGISTERS
0630 : *
0640 : *
0650 CHAR STX *XSAV SAVE X REG
0660 STY *YSAV " Y
0670 C1 PHA " A
0680 C2 LDX 00 CLR X-REG
0690 CR? CMP 8D CR ?
0700 BNE LLIM NO
0705 LDA 0A0 GET A SPACE
0710 CR1 LDY CH GET CURSOR HOR.
0715 INY
0730 CPY *WNDW >= WNDW-1 YET?
0740 BEQ C2 YES, DONE
0760 JSR C1 CALL YOURSELF
0770 JMP CR1
0780 LLIM SEC SETUP FOR SBC
0790 SBC 0A0 CHAR < $A0?
0800 BCC EXIT YES, EXIT
0810 : *
0820 : *
0830 : * PLOTTING ROUTINE
0840 : *
0850 : * PLOTS CHAR IN HIRES AT POSN
0860 : * EQUIV TO CURRENT CH.CV.
0870 : *
0880 : *
0890 PLOT STX *TFH CLEAR CHAR PTR.
0900 ASL
0910 ROL *TFH
0920 ASL
0930 ROL *TFH
0940 ASL TPL, TPH =
0950 ROL *TFH A.C. * 8
0960 CLC +
0970 ADC TABL TABLE START
0980 STA TPL LOCATION
0990 LDA TPH
1000 ADC TABH
1010 STA *TFH
1020 LDA *BASL TEXT BASE ADD.
1030 ADC *CH ADD CURSOR HPOS
1040 STA *GBSL HIRES BASE LO
1050 LDY 07 SETUP Y WITH $7
1060 SCAN LDA *BASH ABCDEFGH ->
1070 AND 03 00000FGH ->
1080 STA *GBSH GBSH
1090 TYA GET STROKE CNT.
1100 ASL
1110 ASL A.C. = Y*4
1120 ORA *GBSH 'OR' WITH 20/40
1130 ORA PAGE GBSL, H ALL SET
1140 STA *GBSH TEST INV MODE
1150 BIT *IFLG
1160 LDA (TPL),Y GET CHAR SLICE
1170 BVS NONI NOT INV MODE
1180 EOR OFF INVERT SLICE
1190 NONI BIT *SFLG 'OR' TO SCRNM?
1200 BVS NORM
1210 ORA (GBSL,X) 'OR' SCRNM W/DAT
1220 NORM STA (GBSL,X) WRITE TO SCRNM
1230 DEY NEXT SLICE?

```

```

1240 BPL SCAN YES, LOOP AGAIN
1250 : *
1260 : *
1270 : * EXIT SECTION
1280 : *
1290 : *
1300 EXIT LDX *XSAV RESTORE X
1310 LDY *YSAV " Y
1320 PLA " A
1330 CRTS JMP COUT GOODBYE!
1340 : *
1350 : *
1360 : * ROUTINE USED BY BASIC TO
1370 : * PRINT CHAR STORED IN CSAV
1380 : * (FROM BASIC, CALL 2172)
1390 : *
1400 CDRW PHA SAVE A-REG
1410 LDA *CSAV GET CHAR CODE
1420 JSR CHAR DISPLAY IT
1430 PLA GET BACK A-REG
1440 RTS
1450 : *
1460 : *
1470 : * CALL HERE TO SET STRIKEOVER
1480 : * MODE. (FROM BASIC, CALL 2180)
1490 : *
1500 : *
1510 SMOD PHA
1520 LDA 00 ENABLE
1530 STA *SFLG STRIKEOVER FLG.
1540 PLA
1550 RTS
1570 : *
1580 : *
1590 : * CALL HERE TO INVERT ENTIRE
1600 : * HI-RES SCREEN, COLOR, AND
1610 : * TEXT MODE.
1620 : * (FROM BASIC, CALL 2187)
1630 : *
1640 : *
1650 INV PHA
1660 STY *YSAV
1670 STX *XSAV SAVE A, X, Y REGS
1680 LDA PAGE CURRENT PAGE
1690 STA *A1H
1700 LDX OFF
1710 LDY 00
1720 STY *A1L PTRS SET UP
1730 INV1 TXA $FF -> AC
1740 EOR (*A1L),Y GET COMP DATA
1750 STA (*A1L),Y ONTO SCREEN
1760 INY NEXT LOC
1770 BNE INV1
1780 INC *A1H
1790 LDA *A1H
1800 AND 1F MASK OFF 20/40
1810 BNE INV1 NEXT PAGE
1820 LDA *IFLG
1830 EOR 0C0 COMP MSB'S
1840 STA *IFLG SET OFF. MODE
1850 LDA *HCOL GET HCOLOR
1860 EOR OFF COMPLEMENT IT
1870 STA *HCOL REPLACE IT
1872 LDA *DCOL GET DRAW COLOR
1873 EOR OFF COMPLEMENT IT
1874 STA *DCOL RESTORE IT
1880 LDX *XSAV
1890 LDY *YSAV
1900 PLA RESTORE A, Y, X
1910 RTS
1920 ENDD EN

```



```

800LLLLL
0800- 48 PHA #08
0801- A9 08 LDA #08
0803- 85 37 STA #37
0805- A9 0F LDA #0F
0807- 85 36 STA #36
0809- A9 FF LDA #FF
080B- 85 48 STA #48
080D- 68 PLA
080E- 60 RTS
080F- 86 45 STX #45
0811- 84 46 STY #46
0813- 48 PHA
0814- A2 00 LDX #00
0816- C9 8D CMP #8D
0818- D0 10 BNE #082A
081A- A9 A0 LDA #A0
081C- AC 24 00 LDY #0024
081F- C8 INY
0820- C4 21 CPY #21
0822- F0 F0 BEQ #0814
0824- 20 13 08 JSR #0813
0827- 4C 1C 08 JMP #081C
082A- 38 SEC
082B- E9 A0 SBC #A0
082D- 90 45 BCC #0874
082F- 86 1F STX #1F
0831- 0A ASL
0832- 26 1F ROL #1F
0834- 0A ASL
0835- 26 1F ROL #1F
0837- 0A ASL
0838- 26 1F ROL #1F
083A- 18 CLC
083B- 6D 30 03 ADC #0330
083E- 8D 1E 00 STA #001E
0841- AD 1F 00 LDA #001F
0844- 6D 31 03 ADC #0331
0847- 85 1F STA #1F
0849- A5 28 LDA #28
084B- 65 24 ADC #24
084D- 85 26 STA #26
084F- A0 07 LDY #07
0851- A5 29 LDA #29
0853- 29 03 AND #03
0855- 85 27 STA #27
0857- 98 TYA
0858- 0A ASL
0859- 0A ASL
085A- 05 27 ORA #27
085C- 0D 2E 03 ORA #032E
085F- 85 27 STA #27
0861- 24 32 BIT #32
0863- B1 1E LDA #1E, Y
0865- 70 02 BVS #0869
0867- 49 FF EOR #FF

```

```

0869- 24 48 BIT #48
086B- 70 02 BVS #086F
086D- 01 26 ORA #26, X
086F- 81 26 STA #26, X
0871- 88 DEY
0872- 10 DD BPL #0851
0874- A6 45 LDX #45
0876- A4 46 LDY #46
0878- 68 PLA
0879- 4C F0 FD JMP #FDF0
087C- 48 PHA
087D- A5 47 LDA #47
087F- 20 0F 08 JSR #080F
0882- 68 PLA
0883- 60 RTS
0884- 48 PHA
0885- A9 00 LDA #00
0887- 85 48 STA #48
0889- 68 PLA
088A- 60 RTS
088B- 48 PHA
088C- 84 46 STY #46
088E- 86 45 STX #45
0890- AD 2E 03 LDA #032E
0893- 85 3D STA #3D
0895- A2 FF LDX #FF
0897- A0 00 LDY #00
0899- 84 3C STY #3C
089B- 8A TXA
089C- 51 3C EOR #3C, Y
089E- 91 3C STA #3C, Y
08A0- C8 INY
08A1- D0 F8 BNE #089B
08A3- E6 3D INC #3D
08A5- A5 3D LDA #3D
08A7- 29 1F AND #1F
08A9- D0 F0 BNE #089B
08AB- A5 32 LDA #32
08AD- 49 C0 EOR #C0
08AF- 85 32 STA #32
08B1- AD 2C 03 LDA #032C
08B4- 49 FF EOR #FF
08B6- 8D 2C 03 STA #032C
08B9- A5 1C LDA #1C
08BB- 49 FF EOR #FF
08BD- 85 1C STA #1C
08BF- A6 45 LDX #45
08C1- A4 46 LDY #46
08C3- 68 PLA
08C4- 60 RTS
08C5- C0 C0 CPY #C0
08C7- C0 C0 CPY #C0
08C9- C0 C0 CPY #C0
08CB- C0 C0 CPY #C0
08CD- C0 C0 CPY #C0

```

Listing 2. CHAR-GRAF routines from the Apple's built-in disassembler. CHAR-GRAF may be entered in either this form using the Apple's mini-assembler, or the hex codes only entered using the monitor.

values. For example, if you wanted to use a character set that was located starting at 1234, you would set TL and TH with the following commands:

POKE TL,1234 MOD 256 : POKE TH,1234 / 256

When CHAR-GRAF receives a character for output, it saves the current 6502 register contents and then does the following:

1. If the character is a return code, blank the rest of the current line and go to step 4.
2. If the character is any other control code, go to step 4.
3. For any other character, find the character set address in TL,TH, and use it to compute the address of the current character within the set. Use the current cursor horizontal and vertical positions to compute the equivalent hi-res screen address. Draw the character on the hi-res screen in the current video mode (normal or inverse). Go to step 4.
4. Restore all the 6502 registers to their entry states and jump to the normal video output routine. This causes the cursor position to be updated normally for each character output.

The assembler source code for CHAR-GRAF is shown in Listing 1. The disassembled object code is shown in Listing 2.

Available
Direct From **DISCOUNT**
COMPUTER PRODUCTS
Master Charge & Visa Accepted
(Please give card no. and expiration date)

APPLE		TEXAS INSTRUMENTS	
Apple II 16K	\$999.	Model 810	1649.
Micro Music Board for Apple	168.	Basic Printer	
OHIO SCIENTIFIC		CENTRONICS	
Superboard II	275.	730-1	750.
C1P 8K	359.	779-2 Tractor	
C4P 8K	625.	Feed Printer	1049.
C4P MF	1548.	Epson Tx-80	
C8P	795.	Tractor Printer	649.
C8P DF	2449.	w/Graftrax Option	699.
C2 OEM	2499.	COMPRINT COMPUTER	
NOVATION INC.		PRINTER INTERNATIONAL	
Cat Modem	179.	Comprint 912 S	588.
OKI-DATA		HAZELTINE	
Micro-80 Printer	695.	1410	798.
		1420	888.
		1500	998.

MAIL & PHONE ORDERS ONLY
SHIPPING EXTRA
DELIVERY FROM STOCK TO 6 WEEKS
P.O. BOX 308
Thiells, N.Y. 10984 (914) 429-9631

REALITY ENDS!

Reality Ends allows you to wander through over 200 parallel universes searching for a way to destroy the forces of Baldir. Will you attack Margon with your horde of fanatics to gain possession of the Amulet of Sangi? Will you equip your marksmen with the finest weapons money can buy? Can you free the Book of Lore from the scaled minotaur without becoming his next meal? Will you save reality from final dissolution?

Reality Ends is a full scale adventure with an extensive listable command set, over 200 fully described universes, and NO messy rule books that must be used to look up information as you play. Imaginative programming allows us to put in 16K what others only dream of doing in 32K.

We guarantee satisfaction or your money back within two weeks of receipt.

TRS-80 Level II 16K \$9.95
Coming soon for APPLE, PET, SORCERER, and NORTHSTAR.

MC

Med Systems Software

P.O. Box 2674 Chapel Hill, NC 27514

VISA

'68' MICRO JOURNAL™

★ The only ALL 6800 Computer Magazine.

Foreign Orders—Add:

Air Mail \$29.00/Year Surface \$9.50/Year

1-Year \$14.50 2 Years \$26.00

3 Years \$36.50

OK, PLEASE ENTER MY
SUBSCRIPTION

Bill my: M/C ☐ — VISA ☐

Card # _____

Expiration Date _____

For ☐ 1-Yr. ☐ 2 Yrs. ☐ 3 Yrs.

Enclosed: \$ _____

Name _____

Street _____

City _____

State _____ Zip _____

'68' MICRO JOURNAL™

3018 Hamill Road
HIXSON, TN 37343

✓ 132



Digital IC Probe & Logic Pulser

PRB-1 DIGITAL LOGIC PROBE

Compatible with DTL, TTL CMOS, MOS and Microprocessors using a 4 to 15V power supply. Thresholds automatically programmed. Automatic resetting memory. No adjustment required. Visual indication of logic levels, using LED's to show high, low, bad level or open circuit logic and pulses. Highly sophisticated, shirt pocket portable (protective tip cap and removable coil cord).

- Automatic threshold resetting • DE to > 50 MHZ
- Compatible with all logic families 4-15 VDC • 10Nsec. pulse response
- Supply O.V.P. to ± 70 VDC • 120 K Ω impedance
- No switches/no calibration • Automatic pulse stretching to 50 Msec.
- Open circuit detection • Automatic resetting memory
- Range extended to 15-25 VDC with optional PA-1 adapter

PLS-1 LOGIC PULSER

The PLS-1 logic pulser will superimpose a dynamic pulse train (20 pps) or a single pulse onto the circuit node under test. There is no need to unsolder pins or cut printed-circuit traces even when these nodes are being clamped by digital outputs.

PLS-1 is a multi-mode, high current pulse generator packaged in a hand-held shirt pocket portable instrument. It can source or sink sufficient current to force saturated output transistors in digital circuits into the opposite logic state. Signal injection is by means of a pushbutton switch near the probe tip. When the button is depressed, a single high-going or low-going pulse of 2 μ sec wide is delivered to the circuit node under test. Pulse polarity is automatic: high nodes are pulsed low and low nodes are pulsed high. Holding the button down delivers a series of pulses of 20 pps to the circuit under test.

- High input impedance (off state) 1 meg ohm • Multi mode-single pulses or pulse trains
- Low output impedance (active state) 2 ohms • Automatic polarity sensing
- Output pulse width 2 μ sec nominal • Automatic current limiting; 7 amps nominal
- Input over voltage protection + 50 volts • Automatically programmed output level
- Finger tip push button actuated • Circuit powered
- Power lead reversal protection • No adjustments required

Multi-family RTL, DTL, TTL, CMOS, MOS and Microprocessors.

PRB 1	DIGITAL LOGIC PROBE	\$38.95	PA 1	HIGH VOLTAGE ADAPTER	\$8.50
PC 1	POWER CORD, Alligator Clips	\$4.95	PT 2	REPLACEMENT PROBE TIP (2)	\$1.50
PC 2	POWER CORD, Micro Hooks	\$9.95	PLS 1	LOGIC PULSER	\$48.95

OK Machine & Tool Corporation 54

3455 Conner St., Bronx, N.Y. 10475 U.S.A.

Tel. (212) 994-6600 Telex 125091

* Minimum billings \$25.00, add shipping charge \$2.00
New York State residents add applicable tax


```

#900. AFF
0900- 00 00 00 00 00 00 00 00
0908- 08 08 08 08 08 08 08 08
0910- 14 14 14 00 00 00 00 00
0918- 14 14 3E 14 3E 14 14 00
0920- 1C 2A 0A 1C 28 2A 1C 00
0928- 26 26 10 08 04 32 32 00
0930- 04 0A 0A 04 2A 12 2C 00
0938- 08 08 08 00 00 00 00 00
0940- 10 08 04 04 04 08 10 00
0948- 04 08 10 10 10 08 04 00
0950- 08 2A 1C 08 1C 2A 08 00
0958- 00 08 08 3E 08 08 00 00
0960- 00 00 00 00 10 10 08 00
0968- 00 00 00 3E 00 00 00 00
0970- 00 00 00 00 00 0C 0C 00
0978- 20 20 10 08 04 02 02 00
0980- 1C 22 32 2A 26 22 1C 00
0988- 08 0C 08 08 08 08 1C 00
0990- 1C 22 20 1C 02 02 3E 00
0998- 1E 20 20 1C 20 20 1E 00
09A0- 10 18 14 12 3E 10 10 00
09A8- 3E 02 1E 20 3E 20 1E 00
09B0- 18 04 02 1E 22 22 1C 00
09B8- 3E 20 10 08 04 04 04 00
09C0- 1C 22 22 1C 22 22 1C 00
09C8- 1C 22 22 3C 20 10 0C 00
09D0- 00 0C 0C 00 0C 0C 00 00
09D8- 00 0C 0C 00 0C 0C 04 00
09E0- 10 08 04 02 04 08 10 00
09E8- 00 00 3E 00 3E 00 00 00
09F0- 04 08 10 20 10 08 04 00
09F8- 1C 22 10 08 08 00 08 00
0A00- 1C 22 3A 2A 3A 02 3C 00
0A08- 08 14 22 22 3E 22 22 00
0A10- 1E 24 24 1C 24 24 1E 00
0A18- 1C 22 02 02 02 22 1C 00
0A20- 1E 24 24 24 24 24 1E 00
0A28- 3E 02 02 1E 02 02 3E 00
0A30- 3E 02 02 1E 02 02 02 00
0A38- 3C 02 02 02 32 22 3C 00
0A40- 22 22 22 3E 22 22 22 00
0A48- 1C 08 08 08 08 08 1C 00
0A50- 20 20 20 20 20 22 1C 00
0A58- 22 12 0A 06 0A 12 22 00
0A60- 02 02 02 02 02 02 7E 00
0A68- 22 36 2A 2A 22 22 22 00
0A70- 22 26 2A 32 22 22 22 00
0A78- 1C 22 22 22 22 22 1C 00
0A80- 1E 22 22 1E 02 02 02 00
0A88- 1C 22 22 22 2A 12 2C 00
0A90- 1E 22 22 1E 0A 12 22 00
0A98- 1C 22 02 1C 20 22 1C 00
0AA0- 3E 08 08 08 08 08 08 00
0AA8- 22 22 22 22 22 22 1C 00
0AB0- 22 22 22 14 14 08 08 00
0AB8- 22 22 2A 2A 2A 36 22 00
0AC0- 22 22 14 08 14 22 22 00
0AC8- 22 22 22 1C 08 08 08 00
0AD0- 3E 20 10 08 04 02 3E 00
0AD8- 1C 04 04 04 04 04 1C 00
0AE0- 00 02 04 08 10 20 00 00
0AE8- 1C 10 10 10 10 10 1C 00
0AF0- 08 14 22 00 00 00 00 00
0AF8- 10 08 3E 7F FF FF BE 1C

```

Listing 3. Hex dump of the 512-byte standard character set. Enter using the Apple monitor. Actually, this set is not quite standard because code 223 is changed to an Apple character.

```

1000. 11FF
1000- 00 00 00 00 00 00 00 00
1008- 36 7F 7F 7F 3E 1C 08 00
1010- 08 1C 3E 7F 7F 1C 1C 00
1018- 08 1C 08 2A 7F 2A 08 00
1020- 08 1C 3E 7F 3E 1C 08 00
1028- 08 1C 2A 08 08 08 08 00
1030- 00 10 20 7F 20 10 00 00
1038- 08 08 08 08 2A 1C 08 00
1040- 00 04 02 7F 02 04 00 00
1048- 7C 40 48 44 7E 04 08 00
1050- 00 00 1C 36 14 14 3E 00
1058- 08 1C 08 1C 14 14 3E 00
1060- 08 2A 5D 49 49 2A 7F 00
1068- 18 24 2A 2E 28 28 3E 00
1070- 41 49 6B 55 55 55 7F 00
1078- 00 2A 3E 14 14 14 3E 00
1080- 00 08 00 3E 00 08 00 00
1088- 00 22 14 08 14 22 00 00
1090- 06 08 10 3C 22 22 1C 00
1098- 10 28 08 08 08 0A 04
10A0- 38 08 08 0A 0C 08 00
10A8- 00 00 3E 14 14 14 00
10B0- 00 1C 22 22 14 14 36 00
10B8- 08 1C 2A 2A 1C 08 00
10C0- 00 1C 22 7F 22 1C 00 00
10C8- 49 2A 2A 1C 08 08 00
10D0- 3E 22 04 08 04 22 3E 00
10D8- 00 20 1C 02 20 1C 02 00
10E0- 00 12 12 12 2E 02 02 00
10E8- 00 3C 0A 08 08 08 00
10F0- 00 4C 52 22 52 4C 00 00
10F8- 00 20 10 08 04 3E 00 00
1100- 0C 12 12 0C 00 00 00 00
1108- 00 00 1C 20 3C 22 3C 00
1110- 02 02 1A 26 22 22 1E 00
1118- 00 00 1C 22 02 22 1C 00
1120- 20 20 2C 32 22 22 3C 00
1128- 00 00 1C 22 3E 02 1C 00
1130- 18 24 04 0E 04 04 04 00
1138- 00 00 2C 32 22 3C 20 1E
1140- 02 02 1A 26 22 22 22 00
1148- 08 00 0C 08 08 08 1C 00
1150- 20 00 20 20 20 20 22 1C
1158- 02 02 12 0A 06 0A 12 00
1160- 00 0C 08 08 08 08 1C 00
1168- 00 00 16 2A 2A 2A 2A 00
1170- 00 00 1A 26 22 22 22 00
1178- 00 00 1C 22 22 22 1C 00
1180- 00 00 1E 22 22 1E 02 02
1188- 00 00 3C 22 22 3C 20 20
1190- 00 00 1A 26 02 02 02 00
1198- 00 00 3C 02 1C 20 1E 00
11A0- 04 04 1E 04 04 24 18 00
11A8- 00 00 22 22 22 32 2C 00
11B0- 00 00 22 22 14 14 08 00
11B8- 00 00 2A 2A 2A 2A 14 00
11C0- 00 00 22 14 08 14 22 00
11C8- 00 00 22 22 22 3C 20 1C
11D0- 00 00 3E 10 08 04 3E 00
11D8- 10 08 08 04 08 08 10 00
11E0- 08 08 08 00 08 08 08 00
11E8- 04 08 08 10 08 08 04 00
11F0- 00 04 2A 10 00 00 00 00
11F8- 2A 14 2A 14 2A 14 2A 00

```

Listing 4. Hex dump of the 512-byte lowercase special character set. The special characters include a mix of game, utility and scientific/math characters. Enter using the Apple monitor.

character is represented by a group of eight bytes. Each byte corresponds to one row of dots in the character cell. For each character, the first byte represents the top row of dots in the cell, and the seven following bytes represent the second through eighth rows. Within each byte, bits 0-6 are mapped onto the screen as dots from left to right (see Fig. 1).

Character sets may contain from one to 96 characters. The first character in any set will be interpreted as a space; following characters will be interpreted in ascending ASCII order. (The first character in each set should be a blank because it is used by CHAR-GRAF to clear the rest of the line when a return code is received.)

Creating a character set by hand is awkward at best. However, the Character Set Editor program will allow you to create new character sets or edit existing ones with the Apple doing most of the work.

Getting CHAR-GRAF to Run

Type in the contents of Listing 3, check the contents of the last few locations and save the data on a tape using the Apple monitor. The same should be done for Listing 4 with a separate tape. These two tapes now hold the versions of the standard 64-character set and the 64-character lowercase, scientific and game character set.

Next, you should type in the hex contents of Listing 2, check your results with the Apple's disassembler and save the data on another section of tape. These are the actual CHAR-GRAF routines.

Now, load the Apple II hi-res graphics routines into memory at location \$C00 as shown on the front of your hi-res demo cassette. The entire package of character sets and routines may now be saved to another section of tape with an *800. 11FFW command. This creates an initial CHAR-GRAF package tape. The other tapes are backup, so that you can easily correct individual parts of the

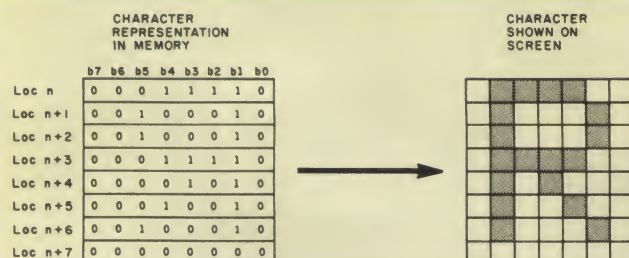


Fig. 1. Within a character set, each character is represented by a block of eight bytes corresponding to the rows of dots in the character. Note that bit 0 represents the leftmost dot in a row, and bit 6 represents the rightmost. The location of the first byte in the set for a given character is: set start location + 8 * (character code - 160).

Character Set Format

Characters on the Apple II are normally displayed as a 5 x 7 dot matrix within a 7 x 8 dot cell. There are 40 columns horizontally and 24 vertically, corresponding to a 280-dot horizontal by 192-dot vertical matrix. Coincidentally, this is the exact format of the hi-res screen, so it is easy for us to emulate normal text operation.

Within the character sets used by CHAR-GRAF, each

DECIMAL			
255	→	BASE PAGE	\$00-\$FF
511	→	STACK AREA	\$100-\$1FF
767	→	INPUT BUFFER	\$200-\$2FF
1023	→	MOSTLY FREE	\$300-\$3FF
	→	TEXT AND LO-RES GRAPHICS DISPLAY PAGE 1	\$400-\$7FF
2047	→	CHARGRAF ROUTINES	\$800-\$8FF
2303	→	STANDARD 64 CHARACTER SET	\$900-\$AFF
2815	→	FREE SPACE	\$B00-\$BFF
3071	→	APPLE II HI-RES GRAPHICS SUBROUTINES	\$C00-\$FFF
4095	→	LOWER CASE & SPECIAL 64 CHARACTER SET	\$1000-\$11FF
4607	→	BASIC VARIABLE STORAGE AREA	\$1200-?
	→	FREE SPACE	
	→	BASIC PROGRAM STORAGE AREA	
	→	OPTIONAL FREE SPACE OR D.O.S. (IF PRESENT)	
-16384	→	I/O ADDRESS SLOTS AREA 0-7	\$C000-\$CFFF
	→	ROM SLOT 1	\$D000-\$D7FF
	→	ROM SLOT 2 (PROGRAMMERS AID IF PRESENT)	\$D800-\$DFFF
-8192	→	BASIC ROMS	\$E000-\$F7FF
-2048	→	MONITOR ROMS	\$F800-\$FFFF

Fig. 2. Memory map of the Apple II with the CHAR-GRAF routines and two 64-character sets resident.

package.

Enter the contents of the demo program, load the CHAR-GRAF package tape and RUN the demo. If it runs properly, you're in good shape because it exercises all of the CHAR-GRAF functions. If not, at least you can have each section on a separate section of tape.

If there are mistakes in the CHAR-GRAF routines or the demo program, you will have to correct them now. Mistakes in the character sets will be easier to correct later after the Editor program is running.

Implementation

The STRIKEOVER function may be changed to an EXCLUSIVE-OR function by changing location \$86D from \$01 to \$51. This can be done from BASIC with a POKE 2157,81, and changed back with a POKE 2157,1. (Be careful! You are actually modifying the CHAR-GRAF code.)

To use CHAR-GRAF with hi-res routines in Apple's Programmer's Aid #1 ROM, you must make the changes in the box below to CHAR-GRAF.

The June '79 issue of CALL

Hex Loc.	From	To
\$85D	\$2E	\$26
\$891	\$2E	\$26
\$8B2	\$2C	\$24
\$8B7	\$2C	\$24

A.P.P.L.E. contains a machine-language linker program by Andy Hertzfeld that appears to be the best available way of attaching machine-language routines to an Apple Integer BASIC program. I use this routine to save the CHAR-GRAF package along with the BASIC program using it.

Note that CHAR-GRAF uses the same screen pointer loca-

tions used by the Apple hi-res routines. This means that after using CHAR-GRAF to print some text, the hi-res position will be left somewhere in the bottom row of the last character printed, and the old position will be forgotten.

The Demo Program

The demo program, written in BASIC, demonstrates all of the current CHAR-GRAF functions. It requires the Apple hi-res graphics routines and both character sets to be resident in memory with it. Notice that most of the PEEK, POKE and CALL locations are assigned as values to descriptive variable names. This allows the use of such statements as:

CALL STRIKEOVER and POKE XL0,5 rather than

CALL 2180 and POKE 800,5

This nice feature of Apple's BASIC allows programs to be more self-documenting than usual and easier to write. Useful routines in the demo program are found at lines 360, 450 and 570. Comments are included.

Character Set Editor

The Character Set Editor program was a result born of my frustration with creating char-

acter sets by hand. I had invariably made mistakes—either typos, dropped bytes on input or, in one case, a set completely transposed left to right. (I wrote a short program to correct that one!)

I decided to write the editor to do as much work as possible for me. It took much longer to write than it took to write CHAR-GRAF in the first place, but the time spent was worth it. I could now create a whole new character set in about a half hour with no errors.

Editor Description

The editor is designed to allow the user to manipulate character sets in variety of ways. Its capabilities include:

- Storage and retrieval of character sets from tape or disk
- Editing existing character sets
- Creating new character sets
- Displaying character sets
- Creating CHAR-GRAF packages on tape with one or two character sets included

The editor is currently designed to handle sets of up to 64 characters. However, larger sets are easy to create in sections,

CHARGRAF Graphics Character Generator

UPPER CASE

```

! " # $ % & '
( ) * + , - . /
0 1 2 3 4 5 6 7
8 9 : ; < = > ?
@ A B C D E F G
H I J K L M N O
P Q R S T U V W
X Y Z \ ] ^ _

```

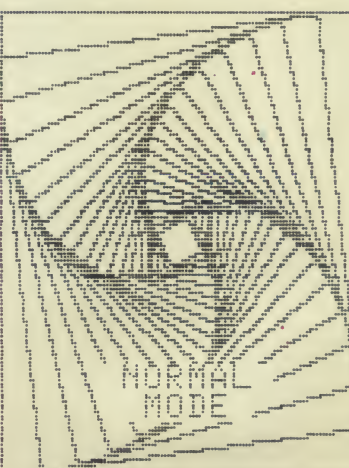
LOWER CASE

```

` ~ ! @ # $ % & '
( ) * + , - . /
0 1 2 3 4 5 6 7
8 9 : ; < = > ?
@ A B C D E F G
H I J K L M N O
P Q R S T U V W
X Y Z \ ] ^ _

```

Mixed text and Graphics



PRESS ANY KEY...

Overstrike Mode:

> < ^ Z Y

User Defined Chars:

^ I ? G Y @ #

```

! " # $ % & '
( ) * + , - . /
0 1 2 3 4 5 6 7
8 9 : ; < = > ?
@ A B C D E F G
H I J K L M N O
P Q R S T U V W
X Y Z \ ] ^ _

```

Fig. 3. Display produced by the demo program showing the various CHAR-GRAF features.

Listing 5. CHAR-GRAF demo program, which creates screen display using both character sets and exercises all of the CHAR-GRAF functions. It also serves as an example of ways to use CHAR-GRAF.

```

0 REM *****
10 REM *
20 REM * COPYRIGHT 1979 *
30 REM * R. B. MOORE *
40 REM *
50 REM * ALL COMMERCIAL RIGHTS *
60 REM * RESERVED *
70 REM *
80 REM *****
85 GOSUB 580: REM **SET LOMEM:4608
90 GOSUB 500: REM ** INIT PROG
95 REM
100 REM ** DO DEMO **
105 REM
110 CALL INIT: POKE -16302,0: CALL NONINV: CALL HOME: CALL LINK
120 TAB 2: PRINT "CHARGRAF ";T$="GRAPHICS ": GOSUB 450:T$="CHARACTER "

130 GOSUB 450:T$="GENERATOR": GOSUB 450
135 REM
140 REM ** DRAW LINE UNDER TITLE **
145 REM
150 POKE HY,9: POKE XHI,0: POKE XLO,7: CALL POSN: POKE XHI,1: POKE XLO,
17: CALL LINE
155 REM
160 REM ** DO SUBTITLE **
165 REM
170 VTAB 4: TAB 13:T$="MIXED": GOSUB 450:T$=" TEXT AND": GOSUB 450
180 VTAB 5: TAB 16:T$="GRAPHICS": GOSUB 450
185 REM
190 REM ** DO U. C. & L. C. SETS **
195 REM
200 VTAB 6: TAB 1: GOSUB 470: VTAB 17: TAB 1: POKE TH,16: GOSUB 470
205 REM
210 REM ** DO U. C. AND L. C. TITLES
215 REM
220 POKE TH,9: VTAB 4: TAB 1: PRINT "UPPER CASE": VTAB 15: TAB 1: PRINT
"LOWER CASE";
225 REM
230 REM ** UNDERLINE TITLES **
235 REM
240 POKE XHI,0: POKE XLO,0: POKE HY,34: CALL POSN: POKE XLO,69: CALL LINE
250 POKE HY,121: CALL POSN: POKE XLO,0: CALL LINE
255 REM
260 REM ** DO INVERSE VIDEO STUFF **
265 REM
270 CALL INV: VTAB 14: TAB 30: PRINT "INVERSE "; VTAB 15: TAB 30
280 PRINT "VIDEO "; VTAB 16: TAB 30: PRINT " ";
290 VTAB 17: TAB 30: GOSUB 470: CALL NONINV
295 REM
300 REM ** SHOW USER CHARACTERS **
305 REM
310 VTAB 8: TAB 30:T$="USER": GOSUB 450: VTAB 9: TAB 30:T$="DEFINED": GOSUB
450
320 VTAB 10: TAB 30:T$="CHARS": GOSUB 450: PRINT ": "; VTAB 12: TAB 31
: PRINT "^]?GY@*";
325 REM
330 REM ** OVERSTRIKE DEMO **
335 REM
340 VTAB 4: TAB 30:T$="OVERSTRIKE": GOSUB 450: VTAB 5: TAB 30:T$="MODE"
: GOSUB 450: PRINT ": ";
350 VTAB 6: TAB 35: PRINT "><^ZY": VTAB 6: TAB 35: CALL STRIKEOVER: PRINT
"-----": CALL LINK
355 REM
360 REM ** DO PICTURE **
365 REM
370 FOR I=0 TO 3: X(I)=56-112*(I/2):Y(I)=64-128*((I MOD 3)>0): NEXT I
380 FOR J=1 TO 20: POKE HY,110+Y(3): POKE XLO,138+X(3): CALL POSN
390 FOR I=0 TO 3: POKE HY,110+Y(I): POKE XLO,138+X(I): CALL LINE
400 K=(X(I)+Y(I)/8)*9/10:Y(I)=(Y(I)-X(I)/8)*9/10:X(I)=K: NEXT I,J
405 REM
410 REM ** FINISH UP **
415 REM
420 VTAB 19: TAB 17: PRINT " NORMAL "; VTAB 20: TAB 18: PRINT " MODE "
;
425 REM
430 REM ** WAIT FOR KEYSTROKE **
435 REM
440 VTAB 24: TAB 13: PRINT "PRESS ANY KEY...":K=0
445 IF PEEK (-16384)<128 THEN 445: POKE -16368,0: IF K=1 THEN 449: FOR
I=1 TO 11
448 CALL INVSCRN: PRINT "": FOR J=1 TO 100: NEXT J,I:K=1: GOTO 445
449 CALL INVSCRN: FOR J=1 TO 500: NEXT J: TEXT : CALL HOME: PR#0: END
450 REM
451 REM ** PRINT T$ W/ 1ST CHAR CAP **
455 REM
460 POKE TH,9: PRINT T$(1,1): POKE TH,16: PRINT T$(2, LEN(T$)): POKE
TH,9: RETURN
465 REM
470 REM ** PRINT CURRENT CHARACTER SET **
475 REM
480 FOR I=0 TO 7: FOR J=0 TO 7: POKE CHARLOC,160+I*8+J
490 CALL CHARDRAW: NEXT J: IF I<7 THEN VTAB ( PEEK (37)+2): TAB PEEK
(36)-7: NEXT I: RETURN
495 REM
500 REM ** SETUP AND DIMS **
505 REM
510 TL=816: TH=817: PG1=32: PG2=64: CHARLOC=71: CHARDRAW=2172: STRIKEOVER=2180
: INVSCRN=2187

```

which may be appended using the monitor's Block Move command.

All character manipulations are done to the set residing in the defined user area \$1000 to \$11FF (4096 to 4607). This 512-byte section of memory can contain up to 64 eight-byte characters. Character sets within the user area may be edited, copied to tape or disk or used to replace the standard set located at \$900-\$AFF (2304-2815). The user area may also be loaded from tape, disk or with a copy of the existing standard set.

Using the Editor

After the editor is typed in and saved on tape, reload the CHAR-GRAF packages tape and RUN the editor. A menu of the various editor options should appear: An explanation of each option follows.

1. Edit/Create character set.

The EDIT/CREATE mode allows you to create or modify character sets by moving a cursor around an enlarged 7 x 8 dot grid. When the option is selected, the Apple is put into hires mode and a titled map of the character set in the user area is displayed along with the edit box and a list of edit commands.

To start, you must enter the code of the first character that you wish to edit. A small box will appear around that character in the map, and an enlarged version of the character will appear in the edit box. The available edit commands are as follows:

<- -	Move cursor left
- ->	Move cursor right
RETURN	Move cursor down
/	Move cursor up
D	Change state of current dot
N	Done, go to next character
P	Done, go to previous character
C	Clear grid in edit box
A	Done, accept new code
R	Restart edit of this character
M	Done, go back to menu

When you are done with a particular character, the contents



PAGE FOR PAGE . . . KILOBAUD MICROCOMPUTING OFFERS YOU MORE.

Go ahead, count them . . . Kilobaud Microcomputing has more pages of articles each month than any other computer magazine. Articles that keep you in touch with the industry whether you're a rank beginner or an advanced hobbyist.

By reading the articles in Kilobaud Microcomputing you'll get to understand how computers work, how they can save you money in your business, what systems will be best for you, how the various programming languages work, what is new in both equipment and programs . . . and you'll learn how to write your own programs. You'll find hundreds of dollars of computer programs listed in the magazine . . . programs you can use for business and entertainment . . . or education.

Subscribe to Kilobaud Microcomputing today . . . with more articles (and better articles) than any other microcomputing journal, page for page you get more for your money.

OK—Sign me up for the industry's #1 value . . .

☐ New Subscriber ☐ Renewal
☐ 1 yr./\$25.00 ☐ 2 yrs./\$38.00 ☐ 3 yrs./\$53.00
☐ Payment enclosed Bill: ☐ Me ☐ Master Charge ☐ Visa ☐ Amerex

Card# _____ Expire Date _____

Signature _____ Interbank # _____

Name _____

Address _____

City _____ State _____ Zip _____

Canadian—\$27.00 for 1 year only in US funds. Foreign—\$35.00 1 year only in US funds. Please allow 6–8 weeks for delivery

● PO Box 997 ● Farmingdale NY 11737

308B7


```

520 INIT=3072: LINK=2048: HOME=-936: LINE=3786: POSN=3761: PLOT=3780: HY=802
    : XLO=800: XHI=801: HCOL=812
530 INV=-384: NONINV=-380
540 POKE TL,0: POKE TH,9: POKE HCOL,255
550 DIM T$(30),X(4),Y(4)
560 RETURN
565 REM
570 REM ** SET LOMEM: 4608 **
575 REM
580 POKE 74,4608 MOD 256: POKE 75,4608/256: POKE 204,4608 MOD 256: POKE
    205,4608/256: RETURN

```

of the edit box are transferred back into the character set if the character has been altered. If you change your mind about an edit, press R before exiting the character. This restores the original character and nullifies any changes that you may have made. When you are through, press M to return to the editor menu.

2. *Load character set.* Character sets may be loaded from tape or disk. When loading from disk, the editor will automatically do a disk CATALOG and then ask for the filename. Make sure that the file you select is a character set; otherwise, the program may be destroyed. After the filename is supplied, the program will ask if you wish to load into the user area or replace the standard set. Reply by pressing S or U. Loading from tape loads into the user area only.

3. *Save character set.* The set in the user area may be saved to tape or disk. If the disk option is selected, the program will ask for a filename before saving to disk.

4. *Create CHAR-GRAF package.* This option creates a package tape that may be used with one of your programs. The package includes CHAR-GRAF, the standard set, the Apple hi-res routines and, optionally, the user set.

5. *Display hi-res character sets.* Draws the character set map and alternately displays the standard set and the user set when a key is pressed. Pressing RETURN will set you back to the menu.

6. *User set → std set.*

7. *Std set → user set.* These two options copy one set to the other. Note that this is a copy, not a swap! After using either option, you will have the same character set in both places.

8. *Exit program.* This unlinks

CHAR-GRAF and ends the program. The package of routines and character sets is not affected, and LOMEM is left set at 4608. The program may be restarted again with the same sets.

General Comments

In *Apple Computer's User Contributed Software*, vols. 3 & 5, there is a character generator program that uses a 128-character set and an Applesoft II demo program to go with it. Coincidentally, the character format is exactly the one I used. This means that you can use the Character Set Editor with that program also.

Some manipulation of partial sets will be required to create the 128-character sets, but it's not difficult. Also, that set is easy to divide into two parts to use with CHAR-GRAF.

The Character Set Editor oc-

cupies approximately 7.5K bytes and requires at least 36K of memory if used with a disk system or 24K in a tape-based system. Removing all of the REM statements from the program will reduce it to about 5.6K. It could be reduced further by combining short lines and shortening the printed messages.

Possible Uses for CHAR-GRAF

In addition to the obvious uses titling plots and graphs, there are many other possibilities. A friend of mine has used CHAR-GRAF to create an I.Q. Test program that uses shape and figure analogies drawn on the hi-res screen along with the text. You could use CHAR-GRAF to create chessmen out of four or nine characters each and PRINT them onto a chessboard using the exclusive-OR mode described earlier. White pieces could be PRINTed nor-

mally, and black pieces could be in inverse-video mode.

A set of playing card characters could be created to add realism to card games such as poker or blackjack (see Bill Depew's Apple 21, from Softape, Inc., using the Screen Machine). For hi-res graphics games you could design ships, planes, tanks or tie-fighters in various rotations. These could be placed on the screen with PRINT statements (and erased with another print if the exclusive-OR mode is used). Programs for the PET computer could be directly converted to the Apple by creating a "PET SET."

Other Alternatives

In recent months, several alternative methods of hi-res character generation have emerged from various Apple after-market suppliers: the Screen Machine (\$19.95), Softape, Inc.; the Super-Chip (ROM) (\$94.95) and Editor (\$19.95), Eclectic Enterprises, Inc.; and the ROMPLUS + (board) (\$169), Mountain Hardware, Inc.

For those of you who just want lowercase, there are several lowercase adapters that retail in the \$50 range in local computer stores. ■

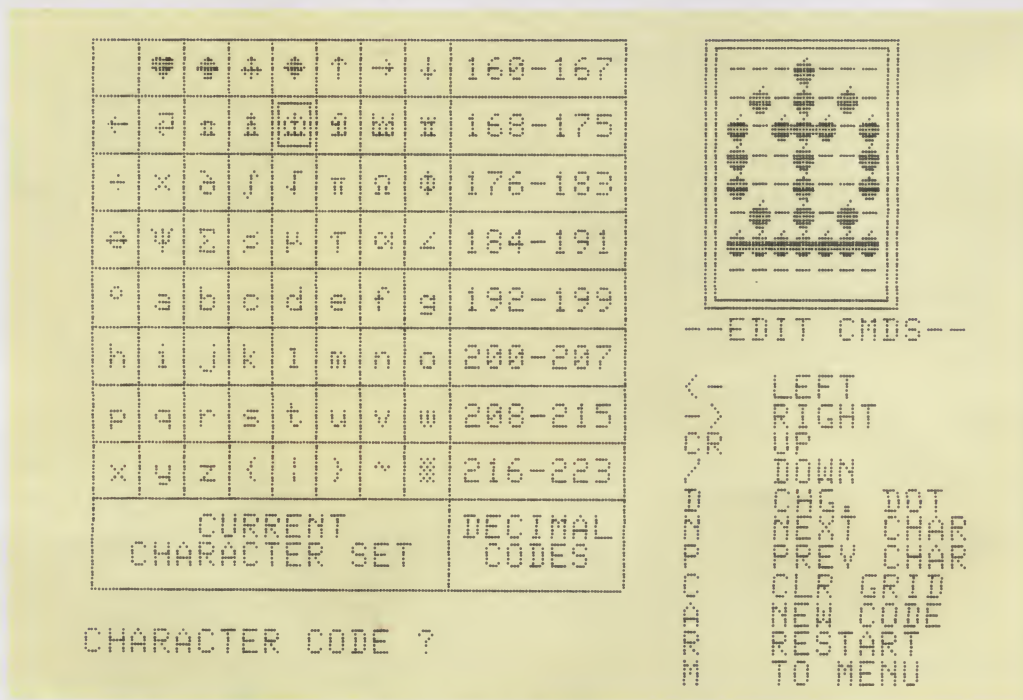


Fig. 4. Editor program edit-mode display. When character is edited, an enlarged version appears within the edit box. Dots in the character are indicated, appropriately, by little apples.

Listing 6. Character Set Editor program, which allows you to create and edit your own character sets with the Apple doing most of the work for you. It requires a 24K system (or 36K, if you have a disk).

```

10 REM *****
20 REM *
30 REM * COPYRIGHT 1979
40 REM * R. B. MOORE
50 REM *
60 REM * ALL COMMERCIAL RIGHTS
70 REM * RESERVED
80 REM *
90 REM *****
100 REM INIT LOMEM&VARIABLES&DO MENU
110 GOSUB 1920: GOSUB 1660: GOTO 1790
120 REM
130 REM XFER EDIT GRID TO CHAR SET
140 REM
150 IF FLG=0 THEN RETURN
160 FOR I=0 TO 7: K=0: FOR J=6 TO 0 STEP -1: VL=I+2: HL=J+30: GOSUB 220
170 K=K+K+(CHAR=223): NEXT J: POKE 4096+I+CCHAR*8, K: NEXT I
180 POKE TH, 16: GOSUB 750: POKE TH, 9: RETURN
190 REM
200 REM PICKUP CHAR FROM SCREEN
210 REM
220 VTAB VL: CHAR= PEEK ( PEEK (40)+ PEEK (41)*256+HL-1): RETURN
230 REM
240 REM CURRENT CHAR TO EDIT GRID
250 REM
260 CALL LINK: GOSUB 620: POKE CHARLOC, 223: FOR I=X TO 7
270 J= PEEK (4096+I+CCHAR*8): L=64
280 IF J>127 THEN J=J-128
290 FOR K=6 TO 0 STEP -1: IF J<K THEN 310
300 J=J-L: VTAB (I+2): TAB (30+K): CALL CHARDRAW
310 L=L/2: NEXT K, I: RETURN
320 REM
330 REM PSEUDO-CURSOR AND KEY INPUT
340 REM CALL WITH VL(0-23), HL(0-39)
350 REM RETURNS KEYSTROKE IN 'KEY'
360 REM
370 FLASH=0: GOSUB 220: POKE CHARLOC, CHAR: I=0
380 I=(I+1) MOD 6: IF I=0 THEN FLASH=1-FLASH: POKE 50, 63+192*FLASH: VTAB
VL: TAB HL: CALL CHARDRAW
390 IF PEEK (-16384)<128 THEN 380: POKE CHARLOC, CHAR: POKE 50, 255: VTAB
VL: TAB HL: CALL CHARDRAW: GOSUB 810: RETURN
400 REM
410 REM *** SETUP CHAR SET MAP ***
420 REM
430 CALL INIT: POKE HCOL, 255: FOR I=0 TO 8: POKE XLO, 3: POKE XHI, 0: POKE
HY, (3+16*I): CALL POSN
440 POKE XLO, 171: CALL LINE: NEXT I: POKE HY, 157: POKE XLO, 3: CALL POSN:
POKE XLO, 171: CALL LINE
450 FOR I=0 TO 8: POKE XLO, (3+16*I): POKE HY, 3: CALL POSN: POKE HY, 131
: CALL LINE: NEXT I
460 POKE XLO, 171: POKE HY, 3: CALL POSN: POKE HY, 157: CALL LINE
470 POKE XLO, 115: CALL POSN: POKE HY, 131: CALL LINE: POKE XLO, 3: CALL
POSN: POKE HY, 157: CALL LINE
480 REM
490 REM LINK TO CHARGRAF AND FILL IN
500 REM CHART TITLES...
510 REM
520 CALL LINK: VTAB 18: TAB 6: PRINT "CURRENT": TAB 18: PRINT "DECIMAL"
: VTAB 19: TAB 3: PRINT "CHARACTER SET": TAB 19: PRINT "CODES":
530 FOR I=0 TO 7: VTAB 2*(I+1): TAB 18: PRINT I*8+160, "-": I*8+167: NEXT
I: RETURN
540 REM
550 REM *** DRAW EDIT BOX ***
560 REM
570 POKE HY, 3: POKE XLO, 196: POKE XHI, 0: CALL POSN: POKE XLO, 1: POKE XHI,
1: CALL LINE: POKE HY, 77: CALL LINE
580 POKE XHI, 0: POKE XLO, 196: CALL LINE: POKE HY, 3: CALL LINE
590 POKE HY, 5: POKE XLO, 199: CALL POSN: POKE XLO, 254: CALL LINE: POKE
HY, 75: CALL LINE
600 POKE XLO, 199: CALL LINE: POKE HY, 5: CALL LINE: RETURN
610 REM
620 REM *** FILL IN EDIT BOX ***
630 REM
640 FOR I=2 TO 9: VTAB (I): TAB (30): PRINT "-----": NEXT I: VTAB 24
: RETURN
650 REM
660 REM SHOW OR DROP EDIT CHAR
670 REM
680 POKE HCOL, 255*FLG: POKE XHI, 0: I=(CCHAR MOD 8+1)*14-9
690 J=(CCHAR/8+1)*16-11: POKE XLO, I: POKE HY, J: CALL PLOT
700 POKE XLO, I+10: CALL LINE: POKE HY, J+12: CALL LINE: POKE XLO, I: CALL
LINE: POKE HY, J: CALL LINE
710 RETURN
720 REM
730 REM *** FILL IN CHARACTER CHART
740 REM
750 FOR I=0 TO 63: TAB (I MOD (8)*2+2): VTAB (I/8*2+2)
760 POKE CHARLOC, 160+I: CALL CHARDRAW
770 NEXT I: VTAB 21: TAB 1: RETURN
780 REM
790 REM ** PICKUP KEY STROKE **
800 REM
810 KEY= PEEK (-16384): IF KEY<128 THEN 810: POKE -16368, 0: RETURN
820 REM
830 REM **DISPLAY HIRES CHAR SETS
840 REM

```

NORTHSTAR™ SOFTWARE

INVENTORY-2™ \$275.

with order entry

- Open ended file capacity
- Dual location inventory management
- Invoicing
- Extensive reporting capabilities
- Full back order capability
- Optional transaction file

MAILROOM™ \$115.

Sophisticated mailing list facility. Data base is flexible enough to permit selection on a complex set of criteria.

TEXTWRITER III™ \$125.

A powerful text formatting program for this generation of complex documents.

P/M PLANNER™ \$175.

Capital equipment inventory system with preventative maintenance scheduling.

INVENTORY-1™ \$115.

Useful where the order entry capabilities of INVENTORY-2 are not required and the inventory size does not exceed 500 items.

HOUSEKEEPER™ \$59.95

Subroutines and utilities.

HOUSEKEEPER II™ \$59.95

More subroutines and utilities.

TOOL-1™ \$29.95

Basic program cross reference utility.

DIGITAL MARKETING

2670 Cherry Lane
Walnut Creek, CA 94596
(415) 938-2880 ✓ 61

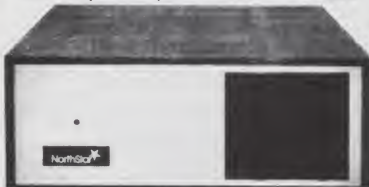
INVENTORY 1 & 2, MAILROOM, P/M PLANNER, HOUSEKEEPER I & II, & TOOL-1 are trademarks of the Software Works, Inc. TEXTWRITER III IS A TRADEMARK OF ORGANIC SOFTWARE

Buy By Mail and Save!

COMPUTERS



INTERTEC SuperBrain® 32K . \$2495
 64K RAM, List \$3345 \$2695
 64K Quad, List \$3995 \$3395
NORTH STAR Horizon I®
 16K D.D. Kit \$1259
 32K D.D. Kit \$1579
 32K Assembled, List \$2695 \$2149
 Horizon 2 32K DD, Assm., \$3095 \$2439
 32K QD, Assm., List \$3595 \$2859



CROMEMCO Z-2, List \$995 ... \$ 829
 System 2, 64K, List \$3990 \$3179
 System 3, 64K, List \$6990 \$5479
ATARI® 400, List \$630 \$ 489
 800, List \$1080 \$ 839
 TI-99/4, List \$1150 \$ 985

DISK SYSTEMS

THINKER TOYS® Discus 2D . \$ 939
 Dual Discus 2D \$1559
 Discus 2 + 2, List \$1549 \$1288

PRINTERS & TERMINALS

PAPER TIGER IDS-440 \$ 849
 with Graphics Option \$ 949
CENTRONICS 730-1, List \$995 . \$ 639
 737, List \$995 \$ 849
T.I. 810 \$1575
INTERTUBE II, List \$995 \$ 729
PERKIN-ELMER Bantam 550 .. \$ 789
TELEVIDEO 912C \$779
 920C \$ 839
HAZELTINE 1420 \$ 839
 1500 \$ 879
SOROC 120 \$ 745

FLOPPY DISKS SPECIAL

5 1/4" Box of 10 ONLY \$29.95

(specify TRS-80, North Star, SuperBrain, etc.)

Most items in stock for immediate delivery. Factory sealed cartons.
 w/full factory warranty. NYS residents add appropriate sales tax.
 Prices do not include shipping. VISA and Master Charge add 3%.
 C.O.D. orders require 25% deposit. Prices subject to change without
 notice.

Computers Wholesale

P.O. Box 144 Camillus, NY 13031



(315) 472-2582



```

850 POKE TH,9: GOSUB 430
860 POKE TH,9: GOSUB 750: CALL HOME: VTAB 21: PRINT "STANDARD CHARACTER SET
"
870 PRINT : PRINT "HIT RETURN TO EXIT TO MENU, ANY OTHER KEY TO ALTERNATE
SETS":S=1
880 GOSUB 810: IF KEY=141 THEN 1790: IF S=0 THEN 860
890 POKE TH,16: GOSUB 750: VTAB 21: PRINT "USER DEFINED CHARACTER SET"
:S=0: GOTO 880
900 REM
910 REM ** SAVE CHARGRAF PKG. **
920 REM
930 CALL HOME: PRINT " *** SAVE CHARGRAF PACKAGE ON TAPE ***": VTAB 3

940 PRINT "OPTION 1:": PRINT "-----": PRINT : PRINT "SAVES": TAB
17: PRINT "LOC. (HEX) * LOAD USING"
950 PRINT "-----": TAB 17: PRINT " * MONITOR": TAB 27: PRINT
" *": PRINT "CHARGRAF": TAB 17: PRINT "800-8DF * 800.FFFF"
960 PRINT "STD. CHAR. SET 900-AFF *": PRINT "UNUSED AREA 800-BFF *
SET BASIC"
970 PRINT "HIRES ROUTINES C00-FFF * LOMEM.4096": PRINT : PRINT : PRINT
"OPTION 2:": PRINT "-----": TAB 27: PRINT " * LOAD USING"
980 PRINT "SAVES ALL OF OPTION 1 * 800.11FFR": PRINT "AND INCLUDES THE
USER- *": PRINT "DEFINED CHARACTER SET. * SET BASIC"
990 PRINT " (1000-11FF HEX)": TAB 27: PRINT " * LOMEM.4608": PRINT
: PRINT "ENTER OPTION #, START RECORDING, AND PRESS RETURN"
1000 INPUT I: IF I<1 OR I>2 THEN 1790: CALL HOME: VTAB 13: PRINT "SAVING DAT
A": IF I=2 THEN 1020
1010 K$="800.FFFF N E88AG": GOTO 1600
1020 K$="800.11FF N E88AG": GOTO 1600
1030 REM
1040 REM *** SAVE USER SET ***
1050 REM
1060 CALL HOME: VTAB 10: PRINT "SAVE USER SET TO TAPE OR DISK (T/D)?": GOSUB
810: IF KEY=212 THEN 1090
1070 IF KEY#196 THEN 1790: CALL HOME: VTAB 10: INPUT "ENTER FILENAME FOR THI
S SET: ",N$: IF N$="" THEN 1790
1080 PRINT : PRINT D$:"BSAVE":N$,"A$1000,L$200,V0": GOTO 1790
1090 CALL HOME: PRINT "SAVE USER DEFINED CHARACTER SET ON TAPE": VTAB 5

1100 PRINT "THIS TAPE MAY BE LOADED WITH THIS PROG- RAM OR WITH THE APPLE MO
NITOR"
1110 PRINT : PRINT "TO LOAD WITH THE MONITOR:": PRINT : PRINT "TYPE 1000.11
FFR", START THE TAPE, AND PRESS RETURN"
1120 VTAB 17: PRINT "TO SAVE THE DATA, START RECORDING AND PRESS RETU
RN"
1130 GOSUB 810: IF KEY-128<13 THEN 1790
1140 CALL HOME: VTAB 12: PRINT "RECORDING DATA ON TAPE":K$="1000.11FF N E88
AG": GOTO 1600
1150 REM
1160 REM ** LOAD CHARACTER SET **
1170 REM
1180 CALL HOME: VTAB 10: PRINT "LOAD SET FROM TAPE OR DISK (T/D)?": GOSUB
810
1190 IF KEY=212 THEN 1230: IF KEY#196 THEN 1790: CALL HOME: PRINT D$:"CATALO
G": PRINT : INPUT "SET FILENAME ?":N$
1200 IF N$="" THEN 1790: PRINT : PRINT "STD SET OR USER SET (S/U)? ": GOSUB
810: IF KEY=213 THEN 1220
1210 IF KEY#211 THEN 1790: PRINT D$:"BLOAD":N$,"A$900": GOTO 1790
1220 PRINT D$:"BLOAD":N$,"A$1000": GOTO 1790
1230 CALL HOME: PRINT "READ CHARACTER SET TAPE": VTAB 6
1240 PRINT "THIS ROUTINE READS A 512 BYTE CHARACTER SET TAPE INTO THE USER-D
EFINED SET AREA."
1250 PRINT "START THE TAPE PLAYING": PRINT "AND PRESS RETURN": GOSUB
810: IF KEY<13 THEN 1790
1260 K$="1000.11FF N E88AG": CALL HOME: VTAB 13: PRINT "READING IN DATA"
: GOTO 1600
1270 REM
1280 REM EDIT/CREATE NEW USER SET
1290 REM
1300 CALL HOME
1310 POKE TH,9: GOSUB 430: POKE TH,16: GOSUB 750: GOSUB 570: POKE TH,9
1320 POKE 33,13: POKE 32,27
1330 VTAB 11: PRINT "--EDIT CMDS--"
1340 VTAB 13: PRINT "<- LEFT": PRINT "-> RIGHT": PRINT "CR UP": PRINT
"/ DOWN"
1350 PRINT "D CHG. DOT": PRINT "N NEXT CHAR": PRINT "P PREV CHAR"
: PRINT "C CLR GRID": PRINT "A NEW CODE"
1360 PRINT "R RESTART": PRINT "M TO MENU"
1370 POKE 33,27: POKE 32,0: POKE 35,23: VTAB 22: TAB 1: INPUT "CHARACTER COD
E ",CCHAR
1380 POKE 34,0: CALL HOME:CCHAR=CCHAR+160
1390 IF CCHAR<0 OR CCHAR>63 THEN 1790: REM BAD CODE, BACK TO MENU
1400 VTAB 21: TAB 1: PRINT "ASCII CODE = ":CCHAR+160: POKE 33,40: POKE
35,20: CALL HOME
1410 FLG=1: GOSUB 680: GOSUB 260:D=0:FLG=0: GOTO 1430
1420 IF KEY>192 THEN 1440:D=D+(KEY=149)+55*(KEY=136)+7*(KEY=141)+49*(KEY=
175): REM ALTER GRID#
1430 D=D MOD 56:HL=30+D MOD 7:VL=2+D/7: GOSUB 370: GOTO 1420: REM POSN CURS
OR AND GET KEY
1440 IF KEY#208 THEN 1450: GOSUB 150:FLG=0: GOSUB 680:CCHAR=CCHAR-(CCHAR<
0): GOTO 1400: REM PREV CHAR
1450 IF KEY#206 THEN 1460: GOSUB 150:FLG=0: GOSUB 680:CCHAR=CCHAR+(CCHAR<
63): GOTO 1400: REM NEXT CHAR
1460 IF KEY#196 THEN 1490
1470 GOSUB 220:CHAR=173+50*(CHAR=173): POKE CHARLOC,CHAR: VTAB VL: TAB
HL:FLG=1: REM ALTER DOT
1480 CALL CHARDRAW:D=D+1: GOTO 1430
1490 IF KEY#195 THEN 1500: GOSUB 640:FLG=1:D=0: GOTO 1430: REM CLR GRID
1500 IF KEY#210 THEN 1510: GOTO 1410: REM RESTART CHAR
1510 IF KEY#193 THEN 1520: GOSUB 150:FLG=0: GOSUB 680: GOTO 1370: REM ACCEP
T NEW CODE
1520 IF KEY#205 THEN 1430
1530 GOSUB 150: GOTO 1790: REM M FOR MENU
1540 REM STD SET <-- USER SET
1550 K$="900<1000.11FF N E88AG": GOTO 1600
1560 REM USER SET <-- STD SET
  
```



```

1570 K$="1000<900.AFFM N ESSAG"
1580 REM
1590 REM ** EXEC A MONITOR CMD. **
1600 FOR I=1 TO LEN(K$): POKE 511+I, ASC(K$(I,I)): NEXT I: POKE 72,0: CALL
-144
1610 GOTO 1790
1620 END
1630 REM
1640 REM DEFINE USEFULL CONSTANTS
1650 REM
1660 I=J:K:PAGE=814:TBLE=2304: DIM K$(40),N$(26):D$="": REM CNTRL-D
1670 TL=816:TH=817:PG1=32:PG2=64:CHARLOC=71:CHARDRAW=2172
1680 INIT=3072:LINK=2048:HOME=-936:LINE=3786:POSN=3761:PLOT=3780:HY=802
: XLO=800:XHI=801:HCOL=812
1690 INV=-384:NONINV=-380
1700 REM
1710 REM SETUP CHAR TABLE PPOINTER
1720 REM AND HIRES PAGE
1730 REM
1740 POKE TL,0: POKE TH,9: POKE PAGE,PG1
1750 RETURN
1760 REM
1770 REM HANDLE MENU AND CHOICE
1780 REM
1790 TEXT : PR#0: CALL -936: TAB 5: PRINT " *** CHARACTER SET EDITOR ***"
: VTAB 4
1800 PRINT "1. EDIT/CREATE CHARACTER SET": PRINT : PRINT "2. LOAD CHARACTE
R SET": PRINT
1810 PRINT "3. SAVE CHARACTER SET": PRINT : PRINT "4. CREATE CHAR-GRAF PAC
KAGE": PRINT
1820 PRINT "5. DISPLAY HIRES CHARACTER SETS": PRINT
1830 PRINT "6. USER SET --> STD. SET.": PRINT : PRINT "7. STD. SET --> USE
R SET.": PRINT
1840 PRINT "8. EXIT FROM PROGRAM": PRINT
1850 PRINT : PRINT "ENTER THE NUMBER DESIRED": INPUT "AND PRESS 'RETURN' "
:F: IF F<1 OR F>8 THEN 1790
1860 IF F=1 THEN 1300: IF F=2 THEN 1180: IF F=3 THEN 1060: IF F=4 THEN
930
1870 IF F=5 THEN 850: IF F=6 THEN 1550: IF F=7 THEN 1570: TEXT : PR#0: CALL
HOME
1880 PRINT "IF YOU WANT TO SAVE YOUR CHARACTER SET TYPE 'RUN' AND PRESS 'RE
TURN'": END
1890 REM
1900 REM ** SET LOMEM AND V.P.
1910 REM
1920 POKE 74,4608 MOD 256: POKE 75,4608/256: POKE 204,4608 MOD 256: POKE
205,4608/256: RETURN

```



A Warner Communications
Company

PERSONAL COMPUTER SYSTEMS

ATARI® 800™

List \$1080

ONLY \$849

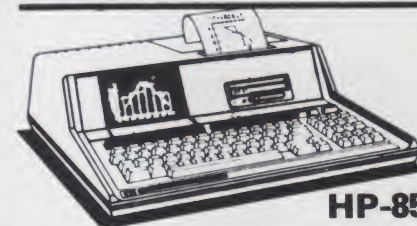


ATARI® 400™, List \$630

OUR PRICE ONLY \$499

820 PRINTER, List \$599.95 \$499

810 DISK DRIVE, List \$699.95 \$589



HP-85

- Extended BASIC Language
- Advance Graphics
- CRT Built-In Display
- Magnetic Tape Cartridge for Storage

CALCULATORS BY

HEWLETT PACKARD

HP-41C Calculator, "A System" ... \$289.95
 HP-32E Scientific w/Statistics ... \$ 53.95
 HP-33C Scientific Programmable ... 99.95
 HP-34C Advanced Scientific
 Programmable 123.95
 HP-37E Business Calculator 58.95
 HP-67 Handheld Fully Advanced
 Programmable Scientific for
 Business & Engineering 298.95
 HP-97 Desktop w/Built-in Printer .. 579.95

APPLE II, 16K, List \$1195 \$ 989
 32K, List \$1395 \$1169
 48K 1259

COMMODORE PET Call for Prices

Prices do not include shipping by UPS. All prices and offers are subject to change without notice.

Personal
Computer
Systems



✓ 303

609 Butternut Street
Syracuse, N.Y. 13208
(315) 478-6800

Computers & Gambling Magazine*

PRESENTS: PROBABILITY HANDICAPPING DEVICE I

A 16K BASIC PROGRAM FOR: HORSE RACE HANDICAPPING!

This amazing program was written by a professional software consultant to TRW Space Systems and is being introduced by the publishers of Computers and Gambling Magazine. "PHD-1" is a large complex basic program requiring a full 16K. It is carefully human factored for easy use. PHD-1 is a comprehensive horse racing system for spotting overlays in thoroughbred sprint races (less than 1 mile). You simply sit down with your computer and the Racing Form the night before the race and answer 5 or 6 questions about each horse's past performance. Your computer then accurately predicts the win probability and odds-line for each horse allowing you to spot overlaid horses while at the track. The user's manual contains a complete explanation of overlay betting.

Statistics for thousands of horses were used to develop this handicapping system. The appendix of the manual contains a detailed tab run of a 100 consecutive race system workout showing an amazing 45% positive return (45¢ for each \$1.00 wagered). A graph is also included showing PHD-1's close fit to the ideal predicted probability vs. actual win percentage curve.

This program features: ☐ Win probability and odds for each horse ☐ Verification display of each horse's parameters prior to entry for easy error correction ☐ Bubble-sort routine for final display ☐ Facility for line printer output ☐ Cassette ARCHIVE routine to store PHD-1's output for later analysis ☐ Complete users manual.

The user's manual may be ordered separately for your perusal for \$7.95 and will be credited if you purchase PHD-1.

PHD-1 User's Manual and 16K Cassette for:
 Apple II Applesoft, Challenger (Specify Type),
 TRS-80† Level II, Pet \$29.95

Make checks payable to: Ca. res. add 6%

✓ 247 JOE COMPUTER

22713 Ventura Blvd., Suite F, Woodland Hills, CA 91364

*BE A WINNER: Get on the Computers and Gambling Products Magazine mailing list for \$3.00 and receive available back issues.
 †TRS-80 is a registered trademark of Tandy Corporation.

SPECIAL PRICES

We offer a complete selection of
hardware, software, peripherals.



OHIO SCIENTIFIC
VECTOR GRAPHICS
HEWLETT-PACKARD
HP-85

Immediate shipping.

VISA/MC O.K.

Contact us for a catalog,
or our quote.

Computer Distributors
P.O. Box 9194-A
Austin TX 78766
(512) 345-9729 ✓ 152



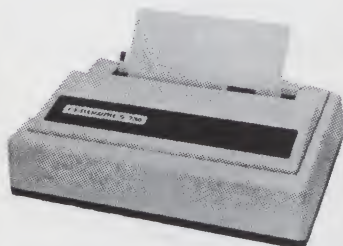
AUTHORIZED TRS-80® DEALER A301

COMPUTER SPECIALISTS



**10%
DISCOUNT
Off
List**

26-4002
64K 1 Drive
\$3499.00



CENTRONICS

Fast 100 CPS Centronics
730 Printer - \$675.00
Text Quality Centronics
737 Printer - \$850.00

MICROSOFT

Model I Basic Compiler.....\$195.00
Model II Basic Compiler.....\$395.00

26-1056 16K Level II System with Keypad.	\$ 700.00
26-1145 RS-232 Board.....	84.00
26-1140 "O" K Interface.....	254.00
26-1141 "16" K Interface.....	381.00
26-1142 "32" K Interface.....	508.00
26-1160 Mini Disk - Drive 0.....	424.00
26-1161 Mini Disk - Additional.....	424.00
26-1154 Lineprinter II.....	720.00
26-1156 Lineprinter III.....	1799.00
26-1157 WP50 Daisy Printer.....	2670.00
26-1180 Voice Synthesiser.....	339.00
26-1181 VOXBOX.....	145.00
26-1104 Factory Upper/Lower Case Modification Installed.....	90.00
26-1605 Scripsit - Tape.....	60.00
26-1563 Scripsit - Disk.....	85.00

ALL OTHER R.S. SOFTWARE
FURNITURE, STANDS, CABLES
AND ACCESSORIES DEDUCT
10% FROM CATALOG PRICE

Novation Cat Modem..\$159.00
CCA Data Management
System.....72.00
Adventure Games
Games 1-9.....14.00



BASF

10-5 1/4 Diskettes.....\$45.00
10-8 Diskettes.....47.00

**15%
DISCOUNT
Off
List**

26-1054
4K Level II
\$527.00



Plug Compatible Lobo 5 1/4
Drives - \$375.00

Versatile Lobo Interface,
8" Drives and Hard Drive.

Call For Prices



**Acorn
Software
Products, Inc.**

GAMES:
Alien Invasion.....\$9.00
UTILITIES:
System Savers.....14.00
EDUCATION:
Language Teacher.....18.00

1-800-841-0860 Toll Free Order Entry

MICRO MANAGEMENT SYSTEMS, INC.

No Taxes on Out Of
State Shipments

Immediate Shipment
From Stock.

DOWNTOWN PLAZA SHOPPING CENTER
115 C SECOND AVE. S.W.
CAIRO, GEORGIA 31728
(912) 377-7120 Ga. Phone No.

Full Factory Warranty
on All Items Sold.

Largest Inventory
In the S.E. U.S.A.

*TRS-80 is a registered trademark of the Tandy Corp. ✓100

Thoughts on the SWTP Computer System

Don't be a scrooge; catch the true spirit of this series with the HUMBUG monitor.

Peter A. Stark
PO Box 209
Mt. Kisco, NY 10549

This month, we continue the ROM monitor discussion we started last month. The first ROM monitor in SWTP systems was MIKBUG. Most software was designed to work with it, and so succeeding monitors have had to copy many of MIKBUG's routines and addresses.

The important MIKBUG entry points, which should be preserved in "compatible" monitors are:

BADDR	E047—Input four hex digits into index register
BYTE	E055—Input two hex digits into A accumulator
OUTHL	E067—Output left BCD digit in A accumulator
OUTHR	E06B—Output right BCD digit in A accumulator
OUTCH	E075—Points to OUTEEE
INCH	E078—Points to INEEE
PDATA1	E07E—Print a text string pointed to by index reg.
INHEX	E0AA—Input a hex digit into A accumulator
OUT2H	E0BF—Output two hex digits pointed to by index reg.
OUT4HS	E0C8—Output four hex digits pointed to by index reg., followed by a space
OUT2HS	E0CA—Output two hex digits pointed to by index reg., followed by a space
OUTS	E0CC—Print a space
START	E0D0—Start MIKBUG
CONTRL	E0E3—Restart MIKBUG
INEEE	E1AC—Input a 7-bit character from keyboard
OUTEEE	E1D1—Output a character to terminal

These sixteen entry points are

the major ones. In addition, there are about 20 more minor ones that you can include if you just copy most of MIKBUG, but which are probably otherwise not needed.

The one exception is the SWTP BILOAD program, which is used to speed up loading of binary tapes such as BASIC. This program uses these additional MIKBUG entry points:

DMPREG	E115—Print out CPU registers
LOAD19	E040—Part of load routine
SAV	E1A5
DE	E1F3
DEL	E1EF
IOUT2	E1E3

This loader does not work with an MP-S interface, so I chose not to include these entry points. However, I did include an entry point called INCH8 at E1F6, which is similar to INEEE except that it enters an 8-bit ASCII character rather than stripping off the parity bit to make it into seven bits, as INEEE does.

MIKBUG also uses the 128-byte scratchpad RAM starting at location A000. There are some differences, however, between MIKBUG and SWTBUG in address assignments in this area, and I chose to go with SWTBUG here rather than with MIKBUG. The important addresses are as follows:

IRQ	A000—IRQ interrupt vector
BEGA	A002—Beginning address for punching, etc.
ENDA	A004—Ending address for punching, etc.

NMI	A006—NMI interrupt vector
SP	A008—User stack pointer
PORADD	A00A—Address of the control port in use
PORECH	A00C—Terminal echo on/off flag
XHI	A00D—High-order half of index register
XLOW	A00E—Low-order half of index register
CKSM	A00F—Checksum
SWIJMP	A012—SWI interrupt vector
PC	A048—Program counter for Go command

MIKBUG had XHI and XLOW one location lower, and some other monitors (as well as some user software) go along with this convention.

I also treated the stack differently. MIKBUG and SWTBUG always initialize the stack when they are started up at A042 and down. The G command then loads the next seven bytes into CPU registers and jumps to a user program with the stack pointer pointing to A049. So, in a way, we can think of the area below A042 as being a monitor stack, while the area just below A049 is a user stack.

But SWTBUG's J command doesn't change the stack pointer when going to a user program; it leaves it pointing to the monitor area. Likewise, when a breakpoint is encountered, it leaves the stack pointer unchanged when it executes its own routines. This results in some weird occurrences when the monitor and user stacks wipe each other out. It becomes even more interesting when you consider that some user software initializes the stack

elsewhere . . . such as at A042.

Because of this, I put other HUMBUG storage locations in a separate RAM—far away from the MIKBUG/SWTBUG RAM—and treated the stacks differently. The monitor stack is now always at D07F. A jump command always goes to a user program with the stack pointer at A07D (with a return address at A07E/F, so jumping to a subroutine will result in a return back to the monitor), and a GO command always goes to the user program with the stack pointer at A049.

This keeps monitor and user stacks completely separate so they never clobber each other. It does require a separate RAM, however, at locations D000–D07F for strictly monitor use. In return, it keeps HUMBUG storage strictly compatible with any stack or storage assignment made by other programs, so there is never a problem.

In my system, the storage at D000 is provided by the 4K board I mentioned earlier. In two other systems that are currently running under HUMBUG, the memory is provided by the CPU board's 6810, relocated to C000–DFFF as also mentioned last month.

I/O Control from the Keyboard

HUMBUG's control terminal is a serial terminal using an MP-S card at port 1, which provides all input to the monitor,

and also standard output. Location PORECH (A00A) contains \$8004, which points to this port. By changing this number, you can redirect the control port to an MP-S card at any other port. (I'm describing the common version of HUMBUG; my own has its I/O at \$F804.)

In addition, HUMBUG can provide an output to a second MP-S at port 0, to a user-written output routine in another EPROM or (in the 3K 2708 version) to the Percom video board.

Any time that the monitor is looking for commands or any time that INEEE or OUTEEE is called, HUMBUG checks this port for a control-S break character arriving from the keyboard. When a control-S is detected, HUMBUG echoes with a bell (control-G) and halts all current I/O.

When I/O is halted, HUMBUG waits for one more character, which is used for controlling monitor ports. If it is received by INEEE, then it is not returned back to whatever program called INEEE. This provides con-

trol of output ports without upsetting other programs. This control character can be one of the following:

CR—cancels the current program and usually does a return to the monitor. But the return is handled through a pointer in RAM, so that other programs could change the pointer and force a return to themselves.

0—turns port 0 on and off.

1—does the same for port 1.

D—does the same for a user-written port routine.

P—turns the pause feature on and off. When the pause feature is on, output will stop every 16 lines to allow it to be read when using CRT terminals.

Any other character is ignored. The 0, 1 and D characters toggle their corresponding ports; if a port is on then it goes off, if it is off then it goes on. Since these characters are not echoed or even returned to calling programs, ports can be turned on and off in the middle of input or output.

The video board output normally runs all the time and is not

controlled. (There is a flag in monitor RAM, however, that disables it if I want to use it for graphics or memory-mapped output.)

When another port is on, then the video output simply runs at the speed of the slowest port. But when all other ports are turned off, then the video board runs at breakneck speed, limited only by CPU speed.

This feature is extremely versatile. Not only does it allow precise printer control, but it also permits rapid skipping ahead at video speed. (The 2K 2716 version, which does not support the video board, will skip ahead even faster when you turn off all output.) Moreover, the control-S/CR combination allows you to abort jammed programs without reaching for the RESET button.

Extended Debugging Facilities

My third requirement for improved debugging power was met in several ways. First, the HD command allows a hex dump of selected memory

areas. The DE command prints a "dessembled" listing of machine code, formatted by address and instruction. Thus, a DE dump of a program might go like this:

```
1000 86 41
1002 BD E1D1
1005 4C
1006 B7 1103
```

An AO command outputs memory data in ASCII so I can scan for strings. An FM command allows filling memory with a specified byte. This is convenient to fill memory with 3F (SWI) instructions to catch programs that go wild. The FI command allows searching memory to find one, two or three bytes. The MO command moves memory contents from one place to another, even if the new area overlaps the old area.

But the most important function is the breakpoint and single-step facility. Up to four breakpoints can be set in programs, and whenever a program encounters such a breakpoint (or any SWI instruction anywhere), an interrupt returns control to HUMBUG, which then prints out the register contents

New Programs from

LEVEL IV PRODUCTS, INC.



Invaders Plus with Stereo Sound by L. Ashmun	\$24.95 on Disk
Invaders Plus-Mono Sound	\$19.95 on Cassette
Match Book Football with Sound	\$9.95 C
Boss (see 80 Micro for details) by V.B. Hester	\$29.95 C
Purge by Breeze Computing	\$29.95 D
Format by Breeze Computing	\$14.95 D
Adventure #9 from Scott Adams	\$14.95 D
Mystery Mansion Adventure by G. Hasset	\$12.95 C
Atlantis Adventure by G. Hasset	\$12.95 C
NEWDOS 80 by Apparat Inc.	\$149.95 D
Lost Dutchman's Gold & Spider Mountain Adventure both only	\$19.95 C
New Low Price on Okidata Uline 80 Printer	\$699.00
Reset Extender	\$3.99
MPI Disk Drive (drive only)	\$245.00
Hard Shell Cases 5'	special ea. \$2.50
8 inch Diskettes for the MOD II	box of 10 \$29.95

C = Cassette D = Disk

Write for more information on any program listed above. All Hardware Level IV Products carries can be repaired in our full service repair department. We repair modified MOD-1 computers. Call for more details.

From Level IV Products Inc. ✓23

32238 Schoolcraft Suite F4 • Livonia, Michigan 48154

1-800-521-3305 outside Mich • 1-313-525-6200 inside Mich

We Accept MASTER CHARGE and VISA



10% discount on prepaid software orders. Please add \$2.00 for shipping and handling. For C.O.D. please add another \$1.25. All hardware shipped freight collect.

and stops. HUMBUG keeps track of breakpoint locations and the instructions existing in those locations and prints a listing of them whenever the BP (breakpoint print) command is given. This reminds you where you have put the breaks. An important feature is that HUMBUG doesn't forget about them either when a jump back to the monitor is done, or when RESET is pressed.

SS is used for single-stepping through programs. Each time you type SS, HUMBUG prints out the address and code of the next instruction, executes it and then prints out the contents of all registers after the instruction is completed. It will single-step all instructions except WAI, SWI and RTI, and cannot single-step into or through ROM. HUMBUG prints out NO! whenever any of these are attempted.

FCROM

FCROM occupies addresses FC00-FFFF. It contains the reset and interrupt vectors that the 6800 CPU needs at locations

FFF8-FFFF. So, without this ROM, the system cannot function at all.

FCROM contains all of the common MIKBUG I/O routines. But since this ROM is at the end of memory, none of these routines are at MIKBUG-compatible addresses. Instead, they are simply consecutively placed wherever they fit. To allow future changes, though, they are vectored through a jump table that starts at FC00:

```
FC00 JMP COLDST
FC03 JMP WARMST
FC06 JMP HOTST
FC09 JMP INEEE
FC0C JMP OUTEEE
etc.
```

Even when FCROM is changed in the future, these pointers will stay in the same place, and so external jumps into FCROM will stay unchanged.

OUTEEE and INEEE provide all of the port control features mentioned before. In addition, FCROM has a command processor that accepts monitor commands from the keyboard and processes them. But it only recognizes two commands—ME

for memory examine and change and JU to jump to a user program. These are the absolute minimum that the monitor could have and still work.

Monitor Extensibility

My fourth major requirement was to allow the monitor to be changed or expanded without too much work. As it now stands, I can add EPROMs without changing the existing ones. Moreover, I can even unplug some of the existing EPROMs from the system, and the rest of the monitor will still work! (Since the 2716 version consists of just one EPROM, this obviously doesn't apply to it.)

The 2708 version of HUMBUG consists of three 1K EPROMs: FCROM, E0ROM and E4ROM.

FCROM is completely self-contained and will run all by itself, even when the other EPROMs are unplugged. It contains all port control and video board control and, with the ME and JU commands, can load and execute other programs.

But it is obviously limited; it relies on the other EPROMs in the system. It also doesn't have MIKBUG-compatible entry points, although it does have all the required routines.

This is where the extensibility feature comes in. Notice in the above table that there is an entry point at FC00:

FC00 JMP COLDST

This is the main entry point when you first turn the system on or when you push RESET. This is a "cold-start," which initializes ports 0 and 1 and initializes the video board.

Once this is done, the FCROM program checks to see whether there is a ROM starting at address E000. If there isn't, then it proceeds with a "warm-start" initialization, where the program turns on port 1, turns off other ports and sets more registers. But if it detects that there is a ROM at E000, it executes a JSR to that ROM before doing the warm-start. This gives E0ROM a chance to execute a cold-start too.

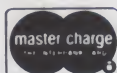
When E0ROM is finished with



INEXPENSIVE, ONE-STOP COMPUTER HARDWARE, SOFTWARE & MICROFILM SHOPPING!

iti
information technology, inc.

56 Kearney Road, Needham, MA 02194 / (617) 444-5702 / TWX 710-325-6838
• New York (212) 938-5945 • Houston, TX (713) 759-0730
• Manchester, NH (603) 668-5977 OEM Inquiries Invited



✓ 242

EXCLUSIVE OFFER EXECUPORT 300

PORTABLE TERMINAL (Factory Reconditioned)

\$995 LIMITED QUANTITY
AT THIS PRICE (ORIGINAL PRICE—\$3300)

- Portable, light-weight terminal
- Operates at 10-15-30 cps
 - Thermal printer
 - Quiet NCR mechanism
 - Built-in acoustic coupler
 - Upper & lower case
 - Carrying case

ALSO AVAILABLE EXECUPORT 3000

ONLY \$1495 (Factory Reconditioned)
(original price—\$4000)

Wide carriage—132 column with graphics

Both EXECUPORTS include...

- 90 day warranty
- Maintenance contract available for \$312/year

QUANTITY DISCOUNTS AVAILABLE

* INTERRUPT VECTORS				
FFE8 FE A000	IRQV	LDX	IRQ	IRQ VECTOR VIA A000
FFED 6E 00	JMP		0,X	
FFED FE A012	SWIV	LDX	SWI JMP	SWI VECTOR VIA A012
FFF0 6E 00	JMP		0,X	
FFF2 FE A006	NMIV	LDX	NMI	NMI VECTOR VIA A006
FFF5 6E 00	JMP		0,X	
(FFFF)	ORG		FFFF8	
FFF8 FF E8	FDB	IRQV	IRQ VECTOR	
FFFA FF ED	FDB	SWIV	SOFTWARE INTERRUPT	
FFFC FF F2	FDB	NMIV	NMI VECTOR	
FFFE FC 00	FDB	COLDV	RESTART VECTOR FOR RESET	

Listing 1. Interrupt and Reset vectors.

its cold-start, it checks for the presence of a ROM at either E400 or E800; if it detects one, it jumps there. Each EPROM gets its chance at a cold-start initialization. If E4ROM is installed at E400, it gets control; if not, then control either goes to the next ROM (if any) or returns to FCROM. Initialization is divided into cold-start and warm-start, and each of these transfers control from ROM to ROM.

When all initialization is completed, FCROM takes over again and looks for a command. If an ME or JU command is entered, then FCROM executes a memory change or jump itself. Otherwise, it puts the two command characters into accumulators A and B and transfers control to other ROMs, in turn. If one of these recognizes a valid command, it executes it; otherwise, control goes to the next ROM. Ultimately, control passes back to FCROM.

Passing control back and forth between ROMs allows more ROMs to be added at any time. Moreover, if one ROM is unplugged, the remaining ROMs

still get control and can still execute their own commands. In this way, you can expand or modify HUMBUG without re-burning all three EPROMs. But there is a price to be paid: an additional amount of housekeeping in each EPROM, which takes up about 40 bytes.

E0ROM

E0ROM, the second 2708, is at locations E000-E3FF. Although the system will run with just FCROM, E0ROM is essential for MIKBUG compatibility because the E0ROM has sixteen MIKBUG-compatible jump vectors that point to the corresponding locations of FCROM. For instance, location E1AC of E0ROM contains an instruction that says JMP to \$FC09, which is the actual entry point for INEE in FCROM. Each MIKBUG entry point has such a JMP.

This is a different approach from the SWTBUG and other monitors, which simply put these routines at the same addresses as MIKBUG did and then try to fit everything in. Here all the

routines are elsewhere, and only JMP instructions exist.

Woven in between these JMPs are the cold- and warm-start routines, the command processor that recognizes monitor commands and routines for the following commands:

LO—Load MIKBUG-formatted tape
 PU—Punch/Save MIKBUG-formatted tape
 EN—Punch end-of-tape with program counter and S9 code
 FD—Bootstrap for Flex disk
 PD—Bootstrap for Percom disk (or go to C000 EPROM)
 GO—Go to user program using A048/A049 address
 CL—Clear terminal screen
 FI—Find one, two or three bytes in memory
 HD—Formatted hex dump of memory
 FM—Fill memory with a byte
 CS—Compute a 16-bit checksum of memory contents
 MT—Perform a memory test
 PC—Print contents of A048/A049 (program counter).

Thus, this ROM puts in all of the necessary routines to make HUMBUG compatible with user programs and also puts in all the common SWTBUG commands, except breakpoints and register examine.

E0ROM has one more routine—FROMTO. This routine essentially asks for an input from the keyboard of a FROM address and a TO address, which are placed into BEGA location A002 and ENDA location A004 in the monitor scratchpad. This routine is called by most other commands to specify the beginning and end of desired memory.

The PU command is a good example. In SWTBUG or MIKBUG, locations A002 and A004 had to be preset to the starting and ending locations before calling the P command. In HUMBUG, the PU command uses the FROMTO routine to ask for the beginning and ending locations. This routine is set up so that entry of a carriage return will make it use the previous values.

E4ROM

E4ROM is the third 2708 and occupies addresses E400 through E7FF. Its cold-start and warm-start initialization and passing control to the next ROM are similar to those of E0ROM, but E4ROM adds the following commands:

DE—Desemble memory and print machine-language codes

BP—Breakpoint printout
 BR—Breakpoint set or reset
 CO—Continue after a breakpoint
 RE—Register examine
 SS—Single-step
 AI—ASCII input into memory
 AO—ASCII output from memory
 MO—Move memory contents
 The exact functions of these will become clear when we examine the actual programs.

Since the system is set up to allow more ROMs to be easily added, there are obviously others available. E8ROM, for instance, adds commands to compare memory contents, change terminal baud rate from the keyboard and change control ports. But these are just frosting on the cake, not really needed for most systems.

Let's examine some of the actual HUMBUG code.

Initialization and Reset

A 6800 requires four address vectors to be located in the top eight memory locations, FFF8 through FFFF, which are used to vector resets and interrupts. These four vectors are:

FFF8 and FFF9—IRQ vector
 FFFA and FFFB—SWI vector
 FFFC and FFFD—NMI vector
 FFFE and FFFF—Reset vector

When you press the reset button or when an interrupt occurs, the 6800 pulls the appropriate address out of one of these four locations and puts it in the program counter. This causes a jump to that address. For that reason, when the system is first turned on, at least the reset vector and the routine it points to must already be in memory. This is why every 6800 system has its ROM located at the very top of memory.

Listing 1 shows the portion of HUMBUG's FCROM that contains the very top of memory. FFF8 through FFFF contain these four vectors: IRQ points to FFE8, SWI points to FFED, NMI points to FFF2 and reset points to FC00. Thus, when a reset is completed, the 6800 starts executing from location FC00, which is the beginning of FCROM.

The interrupt vectors all point to locations in ROM, shown just above that. When an interrupt occurs, the computer goes to the appropriate routine, loads a number from RAM into the index register and then does an in-

* JUMP VECTORS				
(FC00)	ORG	\$FC00		
FC00 7E FC33	COLDV	JMP	COLDST	COLD START ENTRY POINT
FC03 7E FC52	WARMV	JMP	WARMST	WARM START ENTRY POINT
FC06 7E FC94	HOTV	JMP	HOTST	HOT START ENTRY POINT
FC09 7E FD93	INEEV	JMP	INEEE	INPUT CHARACTER ROUTINE
FC0C 7E FDFD	OUTEEV	JMP	OUTEEE	OUTPUT CHARACTER ROUTINE
FC0F 7E FD79	CRLFV	JMP	PCRLF	PRINT CR/LF
FC12 7E FD85	PDATAV	JMP	PDATA	PRINT A STRING
FC15 7E FDE8	INCH8V	JMP	INCH8	
FC18 7E FD49	INHEXV	JMP	INHEX	
FC1B 7E FD24	BYTEV	JMP	BYTE	
FC1E 7E FD16	BADDRV	JMP	BADDR	
FC21 7E FD5E	OUT2HV	JMP	OUT2H	
FC24 7E FD36	OUTHLV	JMP	OUTHL	
FC27 7E FD3A	OUTHRV	JMP	OUTHR	
FC2A 7E FD69	OUT2SV	JMP	OUT2HS	
FC2D 7E FD67	OUT4SV	JMP	OUT4HS	
FC30 7E FD6B	OUTSV	JMP	OUTS	

Listing 2. FCROM jump table.

Basic Software

Put your computer to work doing something useful. Now *two* books, **Practical Basic Programs** and **Some Common Basic Programs**, offer a total of 116 practical, *useful* programs.

The programs cover a variety of practical applications: finance, management decision, statistics, mathematics and science. Each book contains complete program listings in a general version of Basic that will work on most popular computers.

You can use any of the programs *even if you don't know how to program* — just copy it from the book into your computer and go!

Documentation. Always a must, Osborne offers complete documentation with each program.

It includes discussion of what each program does, how it works, and how to use it.

An example of each program in action shows you exactly how the program will look when you use it.

SOME COMMON BASIC PROGRAMS. Now in its third printing, more than 50,000 readers have found useful programs here. It contains 76 programs, including Linear Programming, Tax Depreciation Schedule, Linear Interpolation and Coordinate Plot.

Commodore PET and CBM users. You can purchase a special

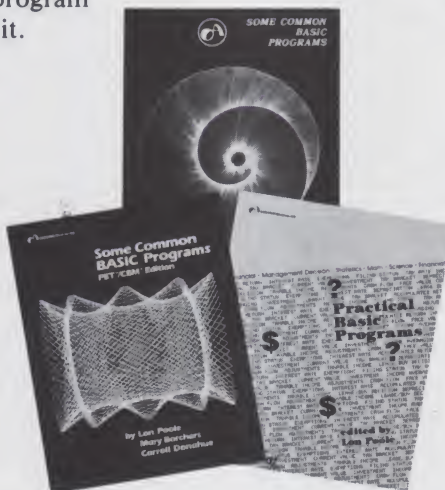
edition of this book, just for use with the Commodore computers. All 76 programs have been modified to run optimally on the PET and CBM, so you won't have to waste a minute adapting them yourself. Be sure to order **Some Common Basic Programs - PET/CBM Edition**.

To go with the PET/CBM edition, you can also purchase the programs ready-to-run on cassette or diskette.

Radio Shack TRS-80 users. You too can purchase all 76 programs adapted specifically to your computer with our TRS-80 cassette. Use the standard edition of **Some Common Basic Programs** for documentation.

PRACTICAL BASIC PROGRAMS.

Just published, this collection of 40 programs covers slightly more sophisticated applications than **Some Common Basic Programs**. There are extra practice problems, with answers, to help you fully understand what these programs can do. Program titles include Income Averaging, Lease/Buy Decision, Syndicated Investment Analysis, Home Budgeting, Critical Path Method, Nonlinear Breakeven Analysis, Statistical Estimation Theory, and Lagrangian Interpolation.



Osborne/McGraw means documented software ✓ 149

Some Common Basic Programs (book)	# 06-3	\$12.50
Some Common Basic Programs - PET/CBM ed. (book)	# 40-3	\$12.50
Some Common Basic Programs - PET/CBM cassette	# 25-X	\$15.00

Some Common Basic Programs - PET/CBM diskette	# 33-0	\$22.50
Some Common Basic Programs - TRS-80 diskette	# 32-2	\$15.00
Practical Basic Programs (book)	# 38-1	\$15.00

To order, return coupon with check or money order. Include 75¢ per item for 4th class mail, \$1.25 per book UPS, or \$2.50 per book air mail in the U.S.

California residents also include local sales tax. To place an order by phone call 415/548-2805.

OSBORNE/McGraw-Hill
630 Bancroft Way Dept. K5
Berkeley, CA 94710

Book	Price	Quantity	Amount

Name _____	Tax <input type="text"/>
Address _____	Shipping <input type="text"/>
City _____ State _____ ZIP _____	
Phone _____ HOW TO SHIP _____	TOTAL <input type="text"/>


```

* COLDSTART INITIALIZATION
FC33 8E D07F COLDST LDS #D07F SET STACK TO MONITOR AREA

* INITIALIZE I/O PORTS
FC36 CE 8000 LDX #8000
FC39 86 03 LDA A #3 PORT 0 AND 1 ACIA
FC3B A7 00 STA A 0,X
FC3D A7 04 STA A 4,X
FC3F 86 0B LDA A #11
FC41 A7 00 STA A 0,X
FC43 A7 04 STA A 4,X
FC45 DD FFA5 JSR VINIT INITIALIZE VIDEO

* SEE IF OTHER ROMS REQUIRE COLD START INITIALIZATION
FC48 B6 E000 LDA A #E000 CHECK ROM-E0
FC4B 81 7E CMP A #7E IS THERE A JUMP?
FC4D 26 03 BNE WARMST NO
FC4F DD E000 JSR #E000 YES, GO TO IT

```

Listing 3. FCROM cold-start initialization.

dexed jump to the address given in the index register. This address is actually specified through RAM and can therefore be changed by user programs, even though the JMP instructions themselves are in ROM. The three addresses used are exactly compatible with SWTBUG:

IRQ is A000
SWI is A012
NMI is A006

FCROM Jump Table

FCROM contains routines that are subject to future change. To avoid having to change other software, all these are handled through a jump table (sometimes also called a "transfer vector") as shown in Listing 2. In particular, note that FC00 is the start location to which the computer jumps on a reset. This is called COLDV (cold-start vector), and it jumps to COLDST at FC33. Two other entry points are WARMV and HOTV, followed by vectors or

pointers to all the MIKBUG-compatible routines.

Cold Start

Listing 3 shows what happens at a reset (or cold-start; a jump to E0D0, which is the MIKBUG/SWTBUG reset address, also winds up at this location).

First, the stack pointer is set to point to the monitor stack at D07F. Then, MP-S ACIAs on ports 0 and 1 are reset and then initialized, followed by a jump to the video board initialization routine. In the case of HUMBUG, this is exactly the same as Percom's suggested video driver initialization, and so there is no need to show it here. If you have this video board, you already have a listing of it; if you don't, then you don't need it and can replace it with initialization for another video board or skip it.

The last four lines of cold-start check to see whether there is another ROM at address

```

* E0 ROM ENTRY VECTORS
E000 7E E1AF CINITV JMP CINIT COLD START INITIALIZATION
E1AC 7E FC09 INEEV JMP INEE VECTOR TO FC ROM

* CINIT - COLD START INITIALIZATION
E1AF 01 CINIT NOP NONE REQUIRED FOR THIS ROM
* SEE IF OTHER ROMS REQUIRE INITIALIZATION
E1B0 B6 E400 LDA A #E400 CHECK NEXT ROM
E1B3 81 7E CMP A #7E IS THERE A JUMP?
E1B5 27 0B BEQ CHORE4
E1B7 B6 E800 LDA A #E800 CHECK THE ROM AFTER THAT
E1BA 81 7E CMP A #7E IS THERE A JUMP?
E1BC 27 04 BEQ CHORE8
E1BE 39 RTS NO, RETURN TO FCROM
E1BF 7E E400 CHORE4 JMP #E400 YES, GO INITIALIZE
E1C2 7E E800 CHORE8 JMP #E800 YES, GO INITIALIZE SECOND ROM

```

Listing 4. E0ROM cold-start initialization.

E000. Since all HUMBUG ROMs start with a jump table, we check to see whether there is a 7E or JMP instruction at address E000. If not, we continue to WARMST. If there is a JMP, we execute a JSR to E000.

Cold-Start of Other ROMs

As it turns out, E0ROM doesn't need any cold-start initialization. Unfortunately, the overhead involved with the expandability of HUMBUG requires that we go through some testing to check for a following ROM (see Listing 4). Here we see the JMP at location E000, which leads to CINIT. Since E0ROM has many MIKBUG-compatible jumps, a lot of its routines have to be squeezed between these jumps. In this case, the CINIT cold-start initialization is placed right after the INEEE vector at E1AC, which is also shown in Listing 4.

The NOP at CINIT shows where the initialization would go, if there was some. The following steps check for a JMP at the start of the next ROM at address E400 and jump to it if present. If not, then they check for a JMP at the start of a ROM at E800 and again jump to it if

present. If neither is present, then there occurs an RTS, which returns back to FCROM's warm-start procedure.

These steps check for a JMP both at address E400 and at E800, so that if an additional ROM is installed at E800, but the one at E400 is pulled out, then the system will simply skip past the removed ROM. The purpose is to allow the monitor to function at least partially, even if some of its ROMs are pulled out. The only crucial ROMs are FCROM and E0ROM, although the system will work even with just FCROM.

Although E0ROM doesn't need cold-start initialization, E4ROM does. Its cold-start initialization is shown in Listing 5. Notice that E4ROM tries to differentiate between a reset or jump to the cold-start location E0D0, as opposed to a real cold-start right after the first power-on. The reason is because breakpoints have to be handled differently.

When you first turn on the power, the list of breakpoints maintained by HUMBUG has to be erased so that, if any new breakpoints are established, HUMBUG doesn't accidentally

```

* E4 ROM ENTRY VECTORS
E400 7E E409 CINITV JMP CINIT COLD START INITIALIZATION
* CINIT - COLD START INITIALIZATION
E409 CE 1234 CINIT LDX #1234 CHECK POWER-UP LOCATIONS
E40C BC D028 CPX POWUP
E40F 26 05 BNE PUP
E411 BC D02A CPX POWUP+2
E414 27 1C BEQ RESET

* INITIAL POWER UP SEQUENCE
E416 CE E6BF PUP LDX #BKRTRM INITIALIZE BREAKPOINT ISS ADDRESS
E419 FF A012 STX SWI JMP
E41C CE 1234 LDX #1234
E41F FF D028 STX POWUP
E422 FF D02A STX POWUP+2 INITIALIZE POWUP FLAGS
E425 CE D036 LDX #DKTAB
E428 86 FF LDA A #FF
E42A C6 0C LDA B #12
E42C A7 00 BKERAS STA A 0,X ERASE BREAKPOINT TABLE
E42E 08 INX
E42F 5A DEC B
E430 26 FA BNE BKERAS REPEAT IF NOT FINISHED

* SEE IF OTHER ROMS REQUIRE INITIALIZATION
E432 B6 E800 RESET LDA A #E800 CHECK NEXT ROM
E435 81 7E CMP A #7E IS THERE A JUMP?
E437 27 0B BEQ CHORE4
E439 B6 EC00 LDA A #EC00 CHECK THE ROM AFTER THAT
E43C 81 7E CMP A #7E IS THERE A JUMP?
E43E 27 04 BEQ CHORE8
E440 39 RTS NO, RETURN TO FCROM
E441 7E E800 CHORE4 JMP #E800 YES, GO INITIALIZE
E444 7E EC00 CHORE8 JMP #EC00 YES, GO INITIALIZE SECOND ROM

```

Listing 5. E4ROM cold-start initialization.

clobber a program by restoring what it thinks is a prior breakpoint.

On the other hand, when you press the reset button or make a jump to the cold-start location E0D0 (or FC00), you don't want to erase the breakpoint table because doing so would make you lose track of locations that have been replaced by a break. So we need a way of telling the difference between the two kinds of resets.

For this reason, four locations in monitor RAM, called POWUP, and located at D028 through D02B, are used as a flag. When you first turn on the power, these locations will contain some random numbers. CINIT in E4ROM (Listing 5) checks the contents of these locations. If the contents are 12, 34, 12 and 34, respectively, then the program assumes that this is not a real cold-start, and so a jump is made to RESET. But at the first cold-start, these locations will be random and will therefore not contain this particular combination. (The chance

of their just accidentally holding this number at power-up is about 1 in 4 billion!)

In that case, the routine at PUP will be performed. This initializes the address for an SWI to the return address BKRETN used for breaks, places the 12-34-12-34 combination in POWUP and erases the breakpoint table BKTAB. Then it goes to RESET. (Once POWUP is set to 12-34-12-34, all subsequent resets will skip this segment.)

The final part of the cold-start procedure again checks whether there are other ROMs, this time at E800 and EC00, and jumps to them if present. Otherwise, an RTS brings us back to FCROM, which will continue with the warm-start initialization. Remember that FCROM went to E0ROM with a JSR. Each ROM then continued to the next ROM with a plain JMP, so that an RTS will bring us all the way back to the first JSR in FCROM.

Next month we'll conclude the listing of this "Monitor to End All Monitors." ■

"TRS-80 is a registered trademark of TANDY CORP."

Call about our fantastic price on 4-drive complete system.	
Level II 4K	\$557.10
Level II 16K	\$720.00
Expansion Interface	\$269.00
Expansion Interface 16K	\$403.20
Expansion Interface 32K	\$524.00
16K Memory Kit for TRS-80 or Apple	\$79.95



TRS-80 & NORTH STAR ADD-ON DRIVES

CUSTOM ENCLOSURE



CABLE INCLUDED

Single drive system in custom enclosure.....	\$414.12
Single drive system in metal enclosure.....	\$375.00
Double drive system in custom enclosure.....	\$824.14

MPI.....	\$279.00
MPI B52, dual headed.....	\$349.00
Shugart 5A400.....	\$286.00
Shugart 5A800.....	\$479.00
Tandon single sided.....	\$279.00
Tandon double sided.....	\$425.00
Siemen 8" drive.....	\$430.00
Single tier walnut enclosure for Shugart.....	\$27.00
Double tier walnut enclosure for Shugart.....	\$45.00
Atari 400.....	\$548.49
Atari 800.....	\$994.49
Hozeltine 1400, 18 month warranty.....	\$649.95
Centronics PI Printer (TRS-80 add on).....	\$398.95
Centronics 779-2 tractor (TRS-80 add on).....	\$1049.95
TI Printer.....	\$1599.00
Bose 2.....	\$599.00
Horizon 1, 32K.....	\$2290.00
Superbroin.....	\$2695.00
SPECIAL! MINI FLOPPY DISKS, box of 10 (with plastic box) only \$28.00 (without plastic box) only \$26.50. Box of 10. 8" disks (in plastic box \$30.00). Centronic 779 ribbons \$3.50 each.	

torasystems INC

WE ACCEPT BANK AMERICAN, VISA, MASTER CHARGE
29-02 23rd Ave., Astoria, N.Y. 11105
TWX 7105822107 (212) 728-5252
(800) 221-1340

BARE BOARDS 8088 5-CHIP SYSTEM

An 8086 Family microcomputer system using 5 IC's, an 8088 CPU, an 8284 clock generator, an 8155 RAM/IO/Timer, an 8755A EPROM/IO and an 8185 (1K x 8) Static RAM. This system has the following:

- 16-bit internal architecture
- Up to 1280 bytes of static RAM
- 2048 bytes of EPROM
- 38 parallel input/output lines
- 14-bit counter/timer
- Instruction set 100% compatible with the 8086

\$29.95

8085 3-CHIP SYSTEM

State-of-the-art system using 3 IC's, an 8085, an 8156, and either an 8355 or 8755. The system has the following:

- 3 MHz 8085 CPU
- 256 bytes static RAM
- 2048 bytes ROM
- 38 parallel input/output lines
- 2 serial input/output lines
- Instruction set 100% upward compatible with 8080A
- 14-bit counter/timer

\$24.95

8202 MEMORY BOARD

This board has 32-2117 Memory Chips and 2 Controller Chips. The board has the following:

- 64K Bytes on one 5.75 x 6.00 PC Card
- Only two support chips:
-1 8202 Dynamic RAM Controller
-1 8282 Octal Latch
- Only one crystal, a few resistors and bypass capacitors needed as external support

\$39.95

PRODUCTS AVAILABLE FROM:
JOHN BELL ENGINEERING
P.O. Box 338
Dept. 8
Redwood City, CA 94064
(415) 367-1137

PRICES:	
8088 5-CHIP SYSTEM	\$29.95
8085 3-CHIP SYSTEM	\$24.95
8202 MEMORY BOARD	\$39.95

Add 6% sales tax in California and 4% for VISA or M.C.

✓ 99

JOHN BELL ENGINEERING

Model EP-2A-79 EPROM Programmer



TRS-80
PET
APPLE
ALM-85
KIM-1
SYM-1
OHIO
SCIENTIFIC

Software available for F-8, 6800, 8085, 8080, Z-80, 6502, 1802, 2650, 6809, 8086 based systems.

EPROM type is selected by a personality module which plugs into the front of the programmer. Power requirements are 115 VAC 50/60 Hz. at 15 watts. It is supplied with a 36-inch ribbon cable for connecting to microcomputer. Requires 1½ I/O ports. Priced at \$155 with one set of software. (Additional software on disk and cassette for various systems.) Personality modules are shown below.

Part No.	Programs	Price
PM-0	TMS 2708	\$15.00
PM-1	2704, 2708	15.00
PM-2	2732	30.00
PM-3	TMS 2716	15.00
PM-4	TMS 2532	30.00
PM-5	TMS 2516, 2716, 2758	15.00
PM-8	MCM68764	33.00

Optimal Technology, Inc.
Blue Wood 127, Earlysville, Virginia 22936
Phone (804) 973-5482

✓ 29

Dial-up Directory

This Directory tells you how to live with an overactive dialing digit.

Frank J. Derfler, Jr.
PO Box 691
Herndon, VA 22070

How much is your phone bill? Most of the letters and messages I receive as a result of these articles start with "I will hate to see my phone bill, but I sure am having a good time . . ."

This article introduces one service that may make a difference in the size of your monthly donation to the telephone company and examines a creative bulletin board program. Finally, I will attempt to throw some light into the dark corner of TRS-80 telecommunications.

Sprint

Is your long-distance phone bill over \$50 a month? Do you live in or near one of the top 50 or so cities in population? Do you usually call to large population centers? Do you have a push-button phone?

If you answered yes to all the above, you may want to "sprint" to Southern Pacific Communications (SPC) to save a few dollars. Sprint is the name of SPC's long-distance dial telephone network. It picks you up from your local telephone system, carries you across country and deposits you in the local system of many large population centers across the country. The service will carry voice or voice bandwidth data (standard 300 baud is fine).

SPC has been in business since 1970. Today, they operate more miles of intercity microwave circuitry than any other spe-

cialized common carrier. The number of specialized carriers such as SPC is growing, and they are all expanding the areas they serve. SPC projects continued growth to more areas of the country. Since 50 percent of the U.S. population lives in the 40 largest cities, SPC is able to serve most of us right now.

To use Sprint, you first dial a local number on your standard push-button instrument. This local number connects you with the Sprint network. You then dial the long-distance number you want and your Sprint authorization code. The network takes over, and you proceed as if you have made a regular voice or data call.

The cost depends upon when and how long you call. If you compare "prime time" 8 AM to 5 PM calls, Sprint saves around 30 percent. Sprint drops to low rates at 5 PM, so if you compare their calls with the regular evening rate, you will probably save more.

From Alabama, a 15-minute call to Los Angeles at 6 PM costs me \$3.69 with normal telephone service. The Sprint call runs about 11 cents per minute (varies with distance), plus a ten cent termination fee, for a total of \$1.75. You have to also prorate a \$10 monthly subscription cost over the number of calls you make.

For example, if you add a pro rata charge of 25 cents to total \$2, you have almost saved enough on that one call to buy a 21L02 static RAM for your memory board. (You could add a pro rata share of the regular telephone service and installation costs to the \$3.69, but I will treat them as sunk costs.) Sprint is billed in six-second increments. The standard telephone service

rounds up in all cases.

Since most of us use our dial-up communications at night and during the weekend, let's consider the cost of a 6 AM call. On the regular phone system, it would cost \$2.30, so you would only save a quarter or so with Sprint. The saving is less, but it is also less convenient.

Sprint is not for everyone. It doesn't serve the Northwest or Northcentral states. There is a minimum \$25 a month charge, so you have to make quite a few calls. You have to analyze your own situation and then determine if the network has a local connection point near you before you decide. If you are interested, contact: SP Communications, PO Box 974, Burlingame, CA 94010, (415) 692-5600.

System Spotlight

Anyone interested in the finer points of bulletin-board or message services should dial into the system in Endicott, New York, (607) 754-5571. Bob Iannucci has put together this service with an eye toward both economy and individual attention. The entire program runs on one single-sided single-density, small, North Star floppy disk. The program is in 8080 assembly language, so there is no overhead for CP/M or BASIC. The files are self-maintaining, and no intermediate or other records are needed.

This flexible system assumes you know what you are doing until you prove you don't. The prompt commands are short to save time for the experienced, but if you need help, detailed explanations are available at every level.

Bob's system asks new users to provide a four-letter password and a user ID. The password is used to kill or edit your old messages. Other people use the ID to send you messages, which you can quickly recall with a special summary command.

The ID prevents users from being inconsistent with the names they use to sign on and send messages. Other systems have a similar user name feature, but if I sign on as John Doe and the message is sent to Mr. Doe, I will not see the message on a sort by name.

Bob must provide an ID to user name cross-reference, and use of this file takes time, so it still isn't a perfect solution. However, regular correspondents will quickly learn each others' IDs.

The user ID also provides semipermanent personalization of the system. The first time you sign on, you must tell the system the number of nuls you need, if you have a bell, what your keyboard delete code is, if you can use lowercase and if you want an echo. The system remembers these factors when you use your ID in the future. This is a time-saver.

This system, like several others, now allows "stacking" of commands. If you know what questions are coming, you can answer them in advance by separating the answers with semicolons. Without the stacking feature, the sequence appears as:

```
IS THIS YOUR FIRST TIME ON THIS SYSTEM? no
HAVE YOU USED A BULLETIN BOARD SYSTEM
BEFORE? yes
WHAT IS YOUR NAME? John doe
```

You could sign on as follows:

```
IS THIS YOUR FIRST TIME ON THIS SYSTEM?
n;y;John doe
```

Stacking is an obvious time-saver if you are familiar with the system. Always check the help (H or ?) command for information on how to make bulletin board systems really work for you. Bob is not in the business of selling software and his program is machine specific, but the ideas and style he has used can be copied by all.

TRS-80

The world of TRS-80 communications has been a cloudy one. National advertising of non-Radio Shack products for communications is limited, and model numbers and types of software have been a subject of some confusion. I have been waiting to get some solid information before making any comments in this series about TRS-80 systems. Now I can discuss one software package that provides good communications capability for the TRS-80. But first, I'll examine the hardware.

If you are going to communicate using a TRS-80, you need the expansion interface, the RS-232 card and a modem. Some RS-232 hardware that does not use the expansion

List of part-time operations run by individuals and computer stores and full-time systems run by commercial companies for communications with their users. These phone numbers were confirmed from my list of 160 reported listings; I have been on each one of these systems.

LOCATION	PHONE NO.	COMMENTS
California Berkeley	415-527-0400	Proxima. The official message system of North Star Computer Company. ABBS. 4 PM-9 AM and weekends.
Brentwood Santa Clara	213-395-1592 408-296-5799	CBBS-type software running on a PDP-8 minicomputer with a hard disk.
Iowa Dubuque	319-557-9618	ABBS.
Kentucky Louisville	502-245-8288	ABBS. 8 PM-6 AM.
New Jersey Wycoff	201-891-7441	ABBS. 10 PM-6 AM.
Tennessee Memphis	901-362-2222	TRS-80-based system. Hobbyist Forum, slanted toward local users.
Texas College Station	713-693-8080	ABBS.
Washington Seattle Seattle	206-244-5438 206-723-3282 (206-723-DATA)	Apple Crate II. Features the "Apple Doctor" service. TRS-80-based system serving a small but active company called The Peripheral People. Ask about their "Micro-connection" modem.

interface is being advertised (see "TRS-80 Serial I/O for Less" in the April 1980 *Microcomputing*, p. 100). If you want to use a smart terminal program with one of these boards, you'd better be able to write your own software. (Note: that is not true of the "Micro-connection" recently announced for the TRS-80, which we will review soon.)

The Radio Shack RS-232 cards apparently got off to a rough start because of some bad quality control, and they still give problems in physical connection. If you have memory errors, system reboots, random error messages and other seemingly unrelated problems, check the connection between the RS-232 card and the expansion interface.

Any of the RS-232-type 103 modems will work with the TRS-80. The Novation CAT modem, sold under the Radio Shack label, does a fine job. Disk systems are not necessary, but they sure are helpful. The Term program sold by Radio Shack is a dumb terminal program that will run without a disk. Other software has more capabilities.

The Bottom Shelf, inc., in Atlanta has come on strong in the TRS-80 software market with a Terminal Control Program (TCP) written by Barry Mulligan that is clever in concept because it is both a stand-alone package and a utility or subroutine to be called as a part of larger programs. The package allows communication with any other computer or terminal and the transfer of programs, data and memory blocks.

All of the RS-232 parameters (word length, etc.) are controlled from the keyboard. Versions for 16K, 32K and 48K are provided, and the package will work from tape or disk. Saving data is done by the standard tape or disk operating system.

Several levels of operation can be selected. Dumb terminal operation is available, but features such as control codes, error checking and a bell (audio tone) are provided for the dumb terminal. The TCP manual calls this KSR—after the keyboard send receive designation often used with printing terminals on communications circuits.

The TCP software also allows you to transmit and receive BASIC programs. The compressed format used internally by the TRS-80 is transmitted under some options. This saves long-distance phone-call time, but you must have another TRS-80 at the other end in this mode.

A clever option allows the TCP software to interact with running programs. A program can run for a while, call TCP, exchange data over a modem, terminate TCP and continue running. A BASIC program is included to read ASCII files (such as Electric Pencil), call TCP and transmit or receive messages. This capability is similar to the ASCII Express program for the Apple II.

The manual that Barry has written is aimed at the practical user. Each option is explained in detail, and good step-by-step instructions are provided. This program is easy to use and well documented. It should serve the needs of both expert and novice keyboard pounders. The program costs about \$20.

Do you market products for microcomputer telecommunications? Do you operate a message system? Let me know what you are up to. Problems? Ask me. Send paper mail to PO Box 691, Herndon, VA 22070 (include a stamped envelope if you want a reply). Save a tree and send electronic mail via the Remote Northstar (404) 939-1520, or to TCB967 on The Source. ■

TI-99/4

home computer

SPECIAL SYSTEMS DISCOUNTS

ANY TI
ORDER OVER
\$1,000. GETS 2% OFF

99/4 CONSOLE	\$ 818.00
COLOR MONITOR	\$ 402.00
SPEECH SYN.	\$ 134.58
RS-232	\$ 194.06
DISK CONTROLLER	\$ 258.75
DISK DRIVE	\$ 431.25



SPECIAL ATARI SALE!
HURRY - QUANTITIES ARE LIMITED

800 COMPUTER SYSTEM	\$ 780.00
400 " "	\$ 440.00
810 DISK DRIVE	\$ 540.00
820 PRINTER	\$ 458.00
8K RAM	\$ 93.75
16K RAM	\$ 156.25

WRITE FOR SOFTWARE PRICES ...

ANALYTICAL SYSTEMS ✓ 319

P.O. BOX 3

OAK RIDGE, TN 37830

VISA & MASTER CHARGE

CALL (615) 691-3772

PRE-FALL COMPUTER SALE !

TO OUR CUSTOMERS:

When we designed our new line of Computer-Home cabinets we were sure that the serious hobbyist did not need a computer, he already had that. What he needed was a quality home for it. With 1/8" aluminum panels, solid wood sides, and the lowest prices on the market our factory is now on overtime just to keep up with the orders.

In a few months look for our new line printer. At 220 lines per min., 80 or 132 column, RS-232 or full parallel, we think we have a winner. To top it off, it is being built around a new printer mechanism from Teletype Corp. Look for it!

Be sure to write for your copy of our catalog with complete specs on Computer-Home plus all of the lines you see here plus some more. And before you buy somewhere else, call for our latest quote on whatever you may need.

The Imagination Machine

IM-1 HOME COMPUTER	\$580.36
EXPANSION INTERFACE	\$186.23
8K RAM	\$94.50
DISK DRIVE	\$322.45
DISK INTERFACE	\$184.20
P-40T PRINTER	\$368.00
TM-150 MODEM	\$188.40

SEND CHECK OR MONEY ORDER
INSTEAD OF CREDIT CARD
AND TAKE A 3% DISCOUNT ON
ANY PURCHASE. \$10.00 MIN.

DRAFTING SUPPLIES

COMPLETE DRAFTING SET:

INCLUDES A 9 PIECE SET OF DIETZGEN DRAFTING INSTRUMENTS, 18 X 24 DRAWING BOARD, AND ASSORTED TEMPLATES, TRIANGLES, PAPER, AND MISC DRAFTING AIDS. A MUST FOR THE HOBBIST THAT WANTS PROFESSIONAL DRAWINGS OF HIS WORK.

~~\$86.50~~ \$67.50

TECHNICAL PENS BY FABER CASTELL:

CONTAINS 4 PENS (00,0,1,2), 4 BARRELS, 1 CONE EXTRACTOR, 1 JOINT ADAPTER, 1 INK BOTTLE, AND 1 MANUAL

~~\$36.00~~ \$28.63

PROFESSIONAL DRAFTING PAPER BY CLEARPRINT WITH TITLE BLOCK PREPRINTED IN CORNER ...

SIZE	10 SHEETS	25 SHEETS	50 SHEETS
8 1/2 X 11	\$2.20	\$3.20	\$6.00
12 X 18	\$3.60	\$5.40	\$10.05
24 X 36	\$12.40	\$18.25	\$34.90

SCALE	APPROVED BY	DRAWN BY
DATE		
		DRAWING NUMBER

CAT-100 FULL COLOR GRAPHICS

Complete line of color imaging systems with high resolution real time video FRAME GRABBER for the S-100 bus.

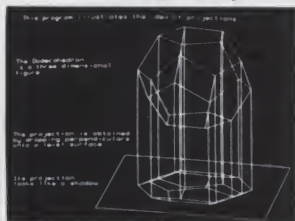
Capture and digitize a video frame in 1/60th of a second. Store up to 2 million bits of image data in on-board buffer. By software, select the best resolution for your application from 256 to 1280 pixels per TV line. Display your digitized image or your computer processed image with up to 256 gray levels or 65,536 simultaneous colors on standard B/W, NTSC or RGB color TV monitors.



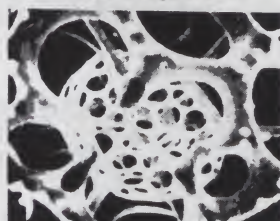
480x512 Contoured digitized image



240x256 Digitized image, 16 levels

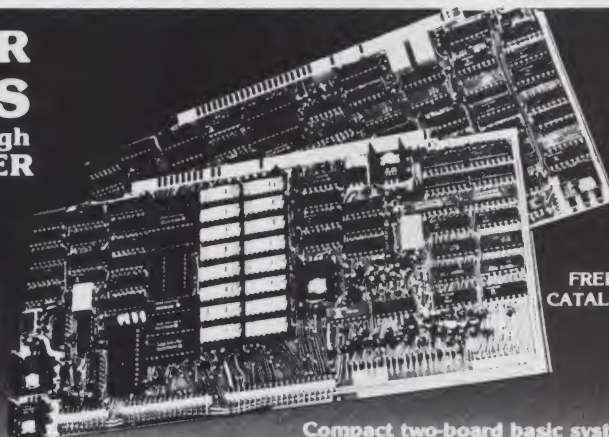


480x512 Computer-generated



240x256 Digitized image, 16 levels

ROBOTICS-AUTOMATED COUNTING AND MEASURING-QUALITY CONTROL MONITORING-PATTERN RECOGNITION-IMAGE PROCESSING-MEDICAL AND SCIENTIFIC RESEARCH



FREE CATALOG

Compact two-board basic system

Features:

- Highest quality 480x512x8 digital video image
- Input capability from TV cameras or other sources
- Variety of synchronization choices
- 2 selectable video A/D conversion circuits
- Choice of 1, 2, 4, 8, 16 or 24 bits per pixel
- 32K-byte image memory on the basic system
- 64K, 128K, 192K and 256K-byte system capacity
- High resolution lightpen input
- Photographic trigger control input
- Software selectable system parameters
- Stand-alone intelligent graphics unit with universal interface

Accessories:

- RGB color monitor
- Hard copy printer/plotter
- High performance lightpen
- Software packages available



441 California Avenue
Palo Alto, CA 94306
415/494-6088

NEW!

COLOR

FOR

TRS-80* & YOUR COLOR TV

JUST PLUG INTO EXPANSION BUS ~ NO MODIFICATION

\$149⁹⁵

INTRODUCTORY OFFER

\$ 99⁹⁵

REGULARLY \$189⁹⁵
WITH CASE, CABLE,
POWER SUPPLY &
SOFTWARE CASSETTE.

UNTIL SEPT. 15, 1980

REGULARLY \$129⁹⁵
LESS CASE, CABLE
AND POWER SUPPLY.

64x32 GRAPHICS IN EIGHT COLORS EXPANDABLE TO 128x192 FOUR COLORS OR
256x192 SINGLE COLOR. ASCII UPPER WITH INVERSE VIDEO.
MIX LOW-RES GRAPHICS & ASCII ON THE SCREEN.
BOTH MODELS INCLUDE RF UP-MODULATOR PARTS.
SOME ASSEMBLY REQUIRED.
ONE YEAR EXCHANGE WARRANTY ON PARTS.
ADD \$7⁰⁰ FOR 48K SYSTEM.

Integrated
Service
Systems Inc.,
AN INTEGRATED SERVICE SYSTEMS COMPANY

1011 WEST BROADWAY
MINNEAPOLIS, MINNESOTA
55411

(612) 522-6631 ✓ 138

MN. RESIDENTS ADD 4% TAX



*TRADEMARK OF TANDY CORP.

CP/M^{®1} – based Business Software for TRS-80^{®2} computers on the fastest Mod-II CP/M with the most features!!!

- Over 610,000 bytes/disk
- Downloading package included
- 1,200 baud operation of serial printers without data loss
- Single drive backup

MOD-II CP/M \$250.00

- Mixed single/double density on any of 4 drives (even a 1-drive system)
- Ultra-fast disk operation
- Emulation of cursor addressing for any of several "dumb" CRTs

MOD-I CP/M \$150.00

- Auto-LF printer support & ASCII top-of-form software (LP111)
- Supplemental document describing our implementation
- User-settable function keys

CBASIC2^{®3} (Mod I or II) \$110.00

The following software for Mod-II CP/M only unless otherwise stated (*-requires CBASIC2):

RM/COBOL^{®4} – Only COBOL for CP/M with alternate keys (multi-key ISAM), CRT screen handling, interactive debug, Z80 code, and the most useful Level 2 features. **Compatible with Tandy's COBOL—but runs faster!** \$495.00

PMS (Property Management System) - Interactive, menu-driven system includes full G/L, budgeting, cash journal, delinquency list, tenant activity/rent roll, complete audit trail and reports on vacancies, lost rent, and vendors \$650.00*
demo disk & manual 75.00*

APH (Automated Patient History) - General-purpose question-asking, answer-printing system furnished as self-administered review-of-systems general patient history (Mod-I also) ... \$175.00*

Osborne & Assoc. CBASIC source programs (Mod-I also):

Payroll w/Cost Accounting \$250.00*

Accts. Payable/Accts. Receivable \$250.00*

Verbatim^{®6} media: (Qty. 100 prices)

5¼" single density \$2.50 ea.

8" certified double density \$4.00 ea.

MAGIC WAND^{®5} – Full-feature word processing, true proportional spacing, file merging, and use of full-screen editor for source programs or data \$400.00

RPA (Residential Property Analysis) - Analyzes income and expense, financing, taxes, inflation and depreciation on home, condo, or apartments over a user-selectable time. Shows payoff in terms of ROI, Cap rate, cash-on-cash. Amortization schedules and worksheet \$300.00*
demo disk & manual 35.00*

RBC (Rent/Buy Comparison) - Sales or investment tool to compare renting and savings account investment vs. purchasing a particular property \$250.00*
demo disk & manual 35.00*

General Ledger w/Cash Journal \$250.00*

O&A CBASIC Books (ea.) \$ 20.00

8" single density \$ 3.00 ea.

450' tape cartridges \$20.00 ea.



8041 Newman Ave., Suite 208
Huntington Beach, CA 92647
(714) 848-1922

Registered trademark of:

*1 Digital Research

*2 Tandy Corp.

*3 Compiler Systems, Inc.

*4 Ryan-McFarland Corp.

*5 Small Business Applications, Inc.

*6 Verbatim Corp.



Distributed in U.K. by:
Microcomputer Applications Ltd.
11, Riverside Court,
Caversham, Reading, England
TEL: (0734) 470425

Let PET Design

Make your computer an engineer/draftsman.

William R. Moore
2035 Barberry Lane
Bowling Green, KY 42101

One of the first programs I purchased after getting my PET computer was George Duisman's Bridge Challenger program. Since the program was almost 8K in length, my PET ran out of memory after

playing only a few hands.

I decided to add an additional 4K of memory to the PET, since the memory expansion connector made this addition easy. However, I soon found out that the PET power supply was not capable of supplying the additional current. A 5 volt, 1.2 Ampere power supply would be needed to power my memory board.

As I pondered over the de-

sign, I decided to let the PET design the power supply. After all, a computer should be capable of doing basic power-supply design, and maybe the PET graphics could be used to draw the schematic.

I wrote the program to use the National Semiconductor LM317 regulator which is an adjustable three-terminal regulator capable of providing dc voltages from 1.2 to 30 volts at

currents up to 1 Ampere. The LM317 comes in three case sizes—TO-5, TO-220 and TO-3 for increased power dissipation. Since the LM317 can only handle currents up to 1 Ampere, larger currents will pass transistors.

The Program

The program will design a dc power supply from 1.2 volts to

Program listing.

```

1  GO TO 20
2  REM GRAPHICS FOR SCHEMATICS
3  PRINT "
4
5  PRINT "0####P_____IN_0#####P_OUT
6  PRINT "§_____U@@2@@@_LM317_###P###
7  PRINT "§_____###P###PD3]_____§_____/
8  PRINT "§120V'D1:§_§_]_L§§§§§:_\
9  PRINT "§PRI_____/\_/_]_____/_R1"§"
10 PRINT "§_____P#_P#_]_:§+_____
11 PRINT "§_____@1'@@K_____C_ '$§§§§§:
12 PRINT "§_____§]:§_____P#_____
13 IF V>=10 THEN GO TO 15
14 PRINT "§"V"_"D2\_] /D4_____"/:GO TO 16
15 PRINT "§"V"_"D2\_] /D4_____/_
16 PRINT "§SEC_____P#]P#_____\"R2"§"
17 PRINT "§_____#####_____/_
18 PRINT 'L§§§§§:_____]_____/_
19 PRINT "_____J#####e#####e#####eW
20 PRINT "_____D1-D4=1N4002
21 RETURN
22 PRINT "

```

```

23 PRINT"0####P_D1_____IN'#####POUT
24 PRINT"%_____/_%_____LM317'#####$W
25 PRINT"%120V'##P/0P##P##P_____,'
26 PRINT"%PRI_____,'#####/_
27 PRINT"%_____/_/_/_ADJ.%_____\R1_"Ø
28 PRINT"%_____@@._____$+_____/_
29 PRINT"%V_"_____)____C_____/_
3Ø PRINT"%SEC_____D2'_____#0_____L$$$$:
31 PRINT"%C.T._____\L:_____%"
32 PRINT"%_____,'##P/%_____%"
33 PRINT"L$$$$:_____/"R2_"Ø
34 PRINT"_____Ø@@@@%_____\
35 PRINT"_____)'%_____/
36 PRINT"_____D1,D2=1n4ØØ2_____L$$$$$$L$$$$$$$$W
38 RETURN
4Ø PRINT"cs_____2N3Ø55("X")"
41 PRINT"_____0#####\VO#####P
42 PRINT"_____%'P##_____'
43 PRINT"_____2_N29Ø7A'____5ØØØ_____'
44 PRINT"_____0#####V%/'##\//\/'P
45 PRINT"0#P_____%'##P_____'
46 PRINT"%_____D1_____0#####OUT

```


Lines 5 through 62 in the program listing develop the power-supply schematics. Statements 5 through 62 use the hyphen for two distinctly different purposes. A hyphen above a character in the listing means that the shift key is to be depressed for that character. This is required since the majority of the graphic symbols on the PET keyboard are in the shift mode. The second use of the hyphen is to represent

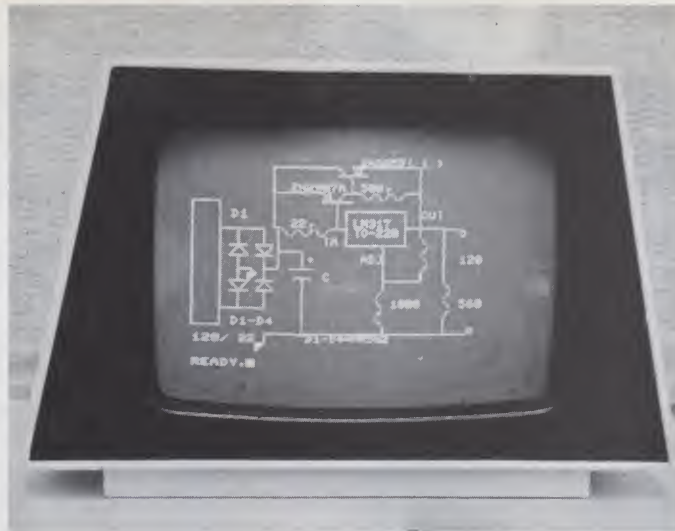


Photo 1. PET's graphics capabilities used for a 5 volt, .5 Amp power supply.

spaces when they are essential. Hyphens between characters (bottom of a line) are used for this purpose.

Statements 5-62 are double-spaced for clarity due to the double use of the hyphen. I have also used abbreviations

Photo 1 shows the design for a 5 volt, half Amp regulated supply. A transformer having a minimum secondary voltage of 8 volts RMS would be required. The LM317 device contains most of the necessary electronics; only a 1400 uF, 12 V dc capacitor and two resistors are required to complete the design. The listing determines the maximum thermal resistance of the heat sink required.

The schematic diagrams generated by the computer for power-supply designs requiring one or more series pass transistors will always show one

```

07 PRINT"% _L_22# 'LM317' :$$$
48 PRINT"% "P##P_] \ / \ / ##T0-22# ' _ 0#W
49 PRINT"% _' - $ - $ ] _____ IN_L#####: \ _ %"
50 PRINT"% _' _ \ _ \ / + @ @ I _____ % _ / _ %
51 PRINT"% _' _ #0_P#] _ ] + _____ ADJ% _ \ _ %"R1"
52 PRINT"% _' _ @I '@K_@1@ _____ % _ / _ %
53 PRINT"% _' _ $$ ): $ _ U2I_C _____ L$$$$ %
54 PRINT"% _' _ \ / \ _ _ ] _____ % _ \
55 PRINT"% _' _ P#_P#_ ] _____ / _____ /
56 IF R2>=1000 THEN GO TO 58
57 PRINT"% _' _ T _ T _ ] _____ \"R2\" _ \"R3\"_:GO TO_59
58 PRINT"% _' _ T _ T _ ] _____ \"_R2\" _ \"_R3\"
59 PRINT"% _' _ #####_ ] _____ / _____ /
60 PRINT"L$: _D1-D4_ ] _____ \ _____ %
61 PRINT"_____ $$$$)$$$$$$$$$L$$$$$$L$$$W
62 PRINT"_120"/V_"% _#D1-D4=MR5#2
63 PRINT"_____)
64 RETURN
65 FOR J=# TO 400 STEP 40
66 POKE 33092+J,32
67 POKE 33093+J,32
68 NEXT J
69 POKE 33092,99
70 POKE 33093,99
71 POKE 33251,64
72 POKE 33252,64
73 POKE 33253,64
74 POKE 33452,99
75 POKE 33453,199
76 GO TO 610
90 PRINT"cs THIS PROGRAM WILL DESIGN A"
91 PRINT"REGULATED D.C. POWER SUPPLY"
92 PRINT"USING A LM317 REGULATOR"
93 PRINT"cd THE MAXIMUM REGULATED D.C. VOLTAGE IS 25V"
94 PRINT"THE MINIMUM OUTPUT VOLTAGE IS 1.2 VOLTS"
95 PRINT"THE MAXIMUM OUTPUT CURRENT IS 5 AMPS"
96 PRINT"cd CURRENT LIMITING IS AUTOMATICALLY"
97 PRINT"PROVIDED BY THE LM317"
98 PRINT"cd THE PROGRAM WILL SPECIFY W.MOORE"
99 PRINT"A_TRANSFORMER_FOR_YOU _____1979"
100 PRINT"OR"
101 PRINT"YOU MAY SPECIFY A TRANSFORMER"
102 PRINT"cd ARE YOU READY TO RUN?"
103 PRINT"IF SO TYPE 1 AND RETURN"

```

```

104 PRINT"TO CONTINUE THE PROGRAM"
105 INPUT A
106 IF A=1 THEN GO TO 108
107 GO TO 105
108 PRINT"CS FINE, TYPE IN YOUR DESIRED"
109 PRINT"OUTPUT VOLTAGE"
110 INPUT VOUT
111 IF VOUT>25 THEN GO TO 545
112 IF VOUT<1.2 THEN GO TO 560
125 PRINT"cd NOW TYPE IN YOUR DESIRED FULL"
130 PRINT"LOAD CURRENT IN AMPERES"
135 INPUT IL
140 IF IL>5 THEN GO TO 590
145 IF IL<.02 THEN GO TO 606
150 VMIN=VOUT+3
155 EMAX=VMIN*1.3
160 VRMS=1+INT (EMAX/1.4)
170 PRINT"cd do YOU DESIRE TO SPECIFY THE"
175 PRINT"TRANSFORMER FOR YOUR POWER SUPPLY?"
180 PRINT"cd TYPE 1 FOR YES, 0 FOR NO"
185 INPUT SEL
190 IF SEL<>1 THEN GO TO 240
195 PRINT"cs DOES YOUR TRANSFORMER HAVE A CENTER TAP?"
196 PRINT"TYPE 1 FOR A C.T., 0 FOR NO C.T"
197 INPUT CT
198 PRINT"NOW TYPE IN TOTAL RMS SECONDARY VOLTAGE"
199 INPUT VSEC
200 IF CT=0 THEN GO TO 220
205 VX=(VSEC/2)-VRMS
210 IF VX<0 THEN GO TO 220
215 VRMS=VSEC/2
218 GO TO 235
220 VX=VSEC-VRMS
225 IF VX<0 THEN GO TO 606
230 VRMS=VSEC
231 CT=0
235 EMAX=1.4*VRMS
240 VDC=(EMAX+VMIN)/2
245 RL=VDC/IL:REM CALCULATE FILTER CAPACITOR
250 C=(EMAX*106)/(200*RL*(EMAX-VMIN))
251 C=INT(1.2*C)
252 CVD=INT(1.25*EMAX)
255 D=VDC-VOUT
260 PCAL=IL*D
265 RL=100
266 DIM DELTAR(39)
267 DIM RES(39)
268 DIM RS(2)
269 DELTAR(0)=4000
270 REM INPUT RESISTOR VALUES
280 DATA 0,10,15,22,33,47,56,68,82,91,100,120,150,180,220,
270,330,390,470,560
283 FOR L=1 TO 20
285 READ RES(L)
287 NEXT L
290 RES (21) = 680
291 RES (22) = 750
292 RES (23) = 820
293 RES (24) = 910
298 FOR I=1 TO 14
299 RES (24+I)=10 * RES (10+I)

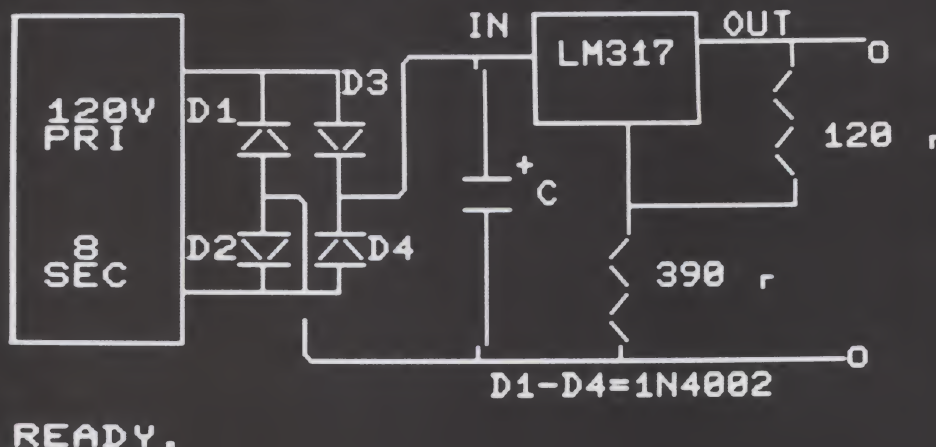
```


series pass transistor (2N3055) with the number of total paralleled transistors in parentheses. Photo 2 shows an example of a 20 V, 2 A power supply requiring one external 2N3055 series pass transistor.

In these cases, all of the load current will flow through the transistors, except for approximately 30 mA, which will flow through the LM317. This means that the regulator will not require a heat sink; only the series pass transistors will require a sink.

The power supply designed for my 4K memory expansion worked the first time and has continued to perform without problems. I built and checked out fifteen other power-supply designs up to 25 volts @ 4 Amps. I was limited to building a 4 Amp power supply due to the transformers available. All power supplies built and tested were stable and had low ripple output. You can add a 1.0 uF tantalum capacitor across the output to ensure low output impedance at high frequencies. ■

OUTPUT VOLTAGE 5 V
OUTPUT CURRENT 5 A
MIN. TRANSFORMER SEC. VOLTAGE 8 VRMS
MIN. FILTER CAPACITOR 1413 UF 12 VDC
VOLTAGE REGULATOR-LM317 CASE TO-220
MAXIMUM THERMAL RESISTANCE OF
REGULATORS HEAT SINK IS 41 C/W



READY.

Photo 2. The author's PET showing a power-supply design using a Darlington connection for higher output current.

```
300 NEXT I
303 REM DETERMINE VALUE OF R1 AND R2.
304 FOR J=1 TO 2
305 RX=(VOUT/1.2-1)*R1
310 FOR I=1 TO 38
315 DELTAR (I) = ABS (RX-RES(I))
320 IF DELTAR (I)>DELTAR(I-1) THEN GO TO 330
325 RS(J)=RES(I)
330 NEXT I
335 R1=120
340 NEXT J
350 RATIO=VOUT/1.2-1
355 R210=RS(1)/100
360 R312=RS(2)/100
365 D1=ABS(RATIO-R210)
```

```
370 D2=ABS(RATIO-R312)
375 IF D1<D2 THEN GO TO 395
380 R1=120
385 R2=RS(2)
390 GO TO 405
395 R1=100
400 R2=RS(1)
405 IF IL>0.5 THEN GO TO 425
410 IF PCAL>5 THEN GO TO 430
415 THETA=INT(100/PCAL-6)
416 SERTR=0
418 TO=220
419 CASE $=T$
420 GO TO 465
425 IF IL>1.5 THEN GO TO 450
```

OHIO SCIENTIFIC CI-SUPERBOARD

HARDWARE—LOW COST EXPANSION PROJECTS

SOUND GENERATOR—Create sounds like phasors, musical organ, explosions, race car motor and much more. Complete documentation on how to build and where to get the parts, plus a demo program. **\$8.95**

LIGHT PEN—Step by step procedures on how to build and how to adjust the sensitivity. Plus 2 demo programs. EZ to build and lots of fun. **\$6.95**

SOFTWARE—Entertainment graphic games.

ASTROIDS—8K-Similar to new arcade video game. Navigate through space avoiding and destroying asteroids and hostile alien spaceships. **\$6.95**

ENTRAPMENT—Compete against the computer or another player, trying to trap your opponent in a fast action, reflex game with skill factors. **\$4.50**

BATTLESTAR—You are the commander, your mission is to seek out and destroy cyclon warriors. **\$4.50**

CRUISE MISSILE—Set the angel and velocity of the missile for the long range target. **\$4.50**

DEPTH CHARGE—Destroy the enemy subs before they surface and destroy your ship. **\$4.50**

INBETWEEN—The card game where you test your luck by trying to break the casino bank. **\$4.50**

Special Offer Complete Software Set **\$19.95**

Send check or money order to: Add 50¢ for postage and handling.

212 DARE DATA & DESIGN
P.O. BOX 8433 BALTIMORE, MD 21234

PROFESSIONAL APPLE II SOFTWARE

THE ELECTRIC GRADE BOOK - A complete disk based grade book and grading system. You can keep track of all of your class records, figure class averages and prepare ranked lists for each class. The system will handle a whole year of assignments for a large class and you can setup separate systems for each class. Will operate with one disk or two. In Applesoft II. #EDMD-100. \$49.95.

PERSONAL ACCOUNTING SYSTEM I - A simple, yet powerful, summary accounting system designed to make personal accounting, budgeting and tax preparation effortless. A few simple key strokes posts, stores and prepares reports for better personal finance. Applesoft II and one disk. PSP-4. \$40.00.

COMPUTER PROGRAMMER III - Sixteen easy lessons to mastery of Applesoft II. Almost 200K of individual instruction. Disk version has a lifetime reference program for advanced programming. Tape TPMT-35. \$25.00. Disk TPMD-40. \$60.00.

TO ORDER
CALL TOLL FREE
(800) 824-7888
Ask for Operator 966

For More Information Write
CompuSoCo
26251 Via Roble
Mission Viejo, CA 92691
In CA Call 800 852-7777

Shipping \$3.00. CA Residents 6% tax



COMPUTER PICTURES

\$9.75 will bring you a complete set of 23 computer pictures (4 Snoopy's, 5 Christmas, 6 Naked Ladies, Star Trek, Abe Lincoln, and more) on 50 sheets of 14 7/8 x 11 computer printout paper. Send check or money order to Data Analysis Systems, Inc., P.O. Box 162, Franktown, Colorado 80116.


```

430 IF PCAL>12 THEN GO TO 450
435 THETA=INT(100/PCAL-3.4)
440 CASE $=K$
441 T0=3
445 GO TO 465
450 SERTR=INT(0.4+PCAL/20)
452 IF SERTR<1 THEN SERTR=1
455 THETA=INT(100/(PCAL/SERTR)-2.4)
460 CASE $=T$
461 T0=220
465 PRINT"cs" SPECIFICATIONS"
470 PRINT"OUTPUT VOLTAGE "VOUT"V"
475 PRINT"OUTPUT CURRENT"IL"A"
480 IF CT=1 THEN GO TO 495
485 PRINT"MIN. TRANSFORMER SEC. VOLTAGE"VRMS"VRMS"
490 GO TO 500
495 PRINT"MIN. TRANSFORMER SEC. VOLTAGE IS"2*VRMS"VRMS CT"
500 PRINT"MIN. FILTER CAPACITOR"C"UF"CVD"VDC"
501 V=RMS*(CT+1)
505 PRINT"VOLTAGE REGULATOR-LM317 CASE"CASE$T0-T0
510 PRINT"MAXIMUM THERMAL RESISTANCE OF"
512 X=SERTR
513 IF SERTR>=1 THEN GO TO 517
515 PRINT"REGULATORS HEAT SINK IS"THETA"C/W"
516 GO TO 536
517 PRINT"TRANSISTOR'S HEAT SINK IS"THETA" C/W"
518 RK=INT(VOUT/.03)
519 FOR I=1 TO 25
520 DELTA(I)=RES(25-I)-RK
521 IF DELTA(I)<=0 THEN GO TO 523

```

```

522 NEXT I
523 R3=RES(25-I)
530 PRINT"NUMBER OF EXTERNAL 2N3055 OR EQUIVALENT"
531 PRINT"TRANSISTORS REQUIRED IS "SERTR
532 PRINT"cd TYPE 1 AND RETURN TO SEE SCHEMATIC"
533 INPUT B:IF B=1 THEN GO SUB 40
534 IF CT=1 GO TO 65
535 GO TO 610
536 IF CT=1 THEN GO TO 539
537 GO SUB 4
538 GO TO 610
539 GO SUB 22
540 GO TO 610
545 PRINT"cs DESIRED OUTPUT VOLTAGE EXCEEDS 25 VOLTS"
546 PRINT"cd TYPE IN YOUR DESIRED OUTPUT VOLTAGE"
555 GO TO 110
560 PRINT"cd DESIRED OUTPUT VOLTAGE IS LESS THAN"
561 PRINT"THE MINIMUM OF 1.2 VOLTS"
570 GO TO 546
590 PRINT"DESIRED LOAD CURRENT EXCEEDS 5 AMP"
591 PRINT"MAXIMUM"
595 GO TO 125
600 PRINT"cs SPECIFIED TRANSFORMER IS TOO SMALL FOR"
601 PRINT"THE DESIRED OUTPUT OF "VOUT" VOLTS"
604 PRINT"cd TYPE IN TOTAL RMS SECONDARY VOLTAGE".
605 GO TO 199
606 PRINT"cd LOAD CURRENT TOO SMALL TO UTILIZE THE__
CAPABILITIES OF THE LM 317"
607 GO TO 135
610 END

```

12" BLACK & WHITE LOW COST VIDEO TERMINAL

Easily interfaced with Radio Shack TRS 80

\$159.00 LIST

Will sell 6 feet coaxial cable \$5.00

Texas residents add 5% sales tax.
Add \$5 for shipping and handling



One year
limited warranty

- Ideal for home, personal and business computer systems; surveillance monitors • 12" diagonal video monitor • Composite video input • Compatible with many computer systems • Solid-state circuitry for a stable & sharp picture • Video bandwidth—12 MHz \pm 3 dB • Input impedance—75 Ohms • Resolution—650 lines Minimum 10% Central 80% of CRT; 550 Lines Minimum beyond central 80% of CRT ref EIA RS-375 • Dimensions—11.375" high; 16.250" wide, 11.250" deep (exclude video input connector) • Weight—6.5 KG (14.3 lbs) net

(Use Master Charge/Visa or send money order.)

Micro Products Unlimited

P.O. Box 1525, Arlington, TX 76010

817/461-8043

Dealer inquiries welcome ✓ 176

"1802"

Unbreakable Systems/Support Software
for any 1802 system.

STARSHIP by John R. Powers, III, is a game which turns your 1802 into a star-fighter equipped with dual Hershey Hyperwarp drives, M1841 computer display, Schwamberger Defense Screens, and twin Balloos Lazars! Imaginative graphics provide exciting action as you police the Millieu Defense District on a week-and-destroy mission! Fun for the whole family! Requires 4K RAM and hexpad, joystick and soundboard are optional. Tapes for ELF-II, Super ELF, VIP (specify 1) Game tape \$9.95 ppp in U.S. Assembled source listing \$14.95 ppp in U.S.

CSIO-5 is an I/O utility providing drivers for parallel ASCII input and CRT-like 1861 video chip alphanumeric output (95 char) for any program! Code is pure procedure (ROM-able) and self-relocating to any page boundary! Screen buffer and stack may be located contiguously or elsewhere. Dual input drivers provide upper/lower case or upper-only as required! CSIO-5 requires 5 pages for code, 3 pages for screen/stack (2K total), parallel keyboard, 1861 chip required. Tapes for ELF-II, Super ELF, VIP (specify 1) \$19.95 ppp in U.S.

CSOS-32 aids machine-language programmers with 13 software tools and 15 support modules accessible to user programs! 3 video resolutions, I/O drivers, including SD (screen driver) for CRT-like output via 1861 (10 lines, var. width chars, avg. 17 per line, auto-scroll) Minimum requirements: 2.5K RAM, hexpad. Specify system and I/O port for peripherals. \$14.95 ppp

CSTP-25 is an 1802 CPU in software for tracing programs! Test, debug, or learn 1802 operations! CPU parameters are displayed via 1861 as target is simulated, command intervention allows dynamic alteration of program flow! Memory protection in CSTP code prevents crashing—neither bad target programs nor user commands can bomb it! Requires: parallel keyboard, 1861, 2.5K + target area. Specify ELF-II, Super ELF or VIP tape. \$14.95 ppp in U.S.

CUDDLY SOFTWARE

Dept. K44

157 CHARTER ROAD

WETHERSFIELD, CT 06019

✓ 228

THE OHIO SCIENTIFIC CHALLENGER 1P AT SPECIAL SAVINGS!!!

Purchase an Ohio Scientific Challenger
1P (4K) at \$349
Receive an additional 4K of static RAM
(\$70 value) free!!

This offer is good until 9/1/80 so order now. Send certified funds, personal check, or VISA/Master charge. Personal checks require 14 days to clear, and credit card orders are subject to a 4% surcharge.

Include \$7.00 for UPS charges and insurance.
Enclose \$ASE and \$2.00 for OSI catalogs.

THE COMPUTER CENTER
\$1591 US 31N ✓ 142
SOUTH BEND IN 46637
(219)277-4655

CI-68A CONTROL INTERFACE



- 8 opto-isolated inputs
- 8 reed relay outputs
- Relay status register
- /IRQ and /NMI jumper selectable
- Complete documentation
- \$79.95 kit
- \$95.00 assembled and tested

AD-68A ANALOG-TO-DIGITAL CONVERTER



- 8 Analog inputs (0-2.5v)
- Single ramp, software driven conversion
- 8bit, 9.6 ms maximum
- Complete documentation
- \$39.95 assembled and tested

For SWTPC 6800 type computer. Write for more information ✓ 128

Terms: US and Canada add 5% shipping. Others add 15% US funds only. TX residents add 5% tax. VISA and MC ok

it INNOVATIVE TECHNOLOGY

510 Oxford Park • Garland, TX 75043 • (214) 270-8393

MAXELL OR **Dysan**

Some computerists pay less - but may not
receive Shugart® or IBM® approved disks.

8" SINGLE SIDE
DOUBLE DENSITY.....Box of 10 for \$60

8" DOUBLE SIDE
DOUBLE DENSITY.....Box of 10 for \$70

5 1/4" MINI.....Box of 10 for \$50

DYSAN® DISKS

5 1/4" MINI.....Box of 5 for \$25

(Specify - 8" Soft or Hard Sector/5" Soft or Hard Sector)



C.O.D. - \$1.00 Additional

Custom Electronics Inc.

238 EXCHANGE STREET
CHICOPPEE, MA. 01013

413-592-4761

established 1960 • closed Mondays

ATARI TI/99-4 PET

Connect your TRS-80, Apple or ANY
other computer to the phone lines.

USR-330 Originate— Auto-Answer Modem



\$339

- 0-300 Baud
- Stand Alone
- RS232
- 1 Year Warranty
- Crystal Controlled
- Bell 103/113
- State of the Art LSI circuitry
- 5 stage active filters

FCC certified for direct
connection to phone lines via
standard extension phone jack

Call or write for free literature

U.S. ROBOTICS, INC.

1035 W. LAKE ST.

CHICAGO, ILL. 60607

(312) 733-0497

Get Your PET on the IEEE 488 Bus

Part 2 of this "opus computerus" examines the file characteristics of the IEEE 488 bus.

Gregory Yob
Box 354
Palo Alto, CA 94301

Your PET has a "built-in" way of communicating through the IEEE 488 bus. In BASIC, the IEEE 488 looks like a file—just as the cassettes are files. The OPEN statement is used to specify a physical device number of 4 to 30, and the open logical file now talks via the IEEE 488 bus.

A complete understanding of PET tape files is a prerequisite for working with the IEEE 488 as a BASIC file. An article in the January 1979 *Kilobaud Microcomputing* ("PET Techniques Explained") covers many "innocent" errors that will result in mysterious malfunctions.

IEEE 488 Information Transfers

Talking to a Device.

1. OPEN a BASIC file to the device's address. For example, OPEN 1,4 will open the IEEE bus to device 4. Your BASIC program will see this as file #1.

2. PRINT# to your OPENed file. PRINT#1,"HELLO,DEVICE" will address the device to listen,

send the string HELLO,DEVICE, add a carriage return with EOI true and then issue the UNT (Untalk) command.

3. Repeat step 2 as needed. Note that after each PRINT#, the IEEE bus is free, since the UNT has been sent.

PRINT# will send the same characters, including the skip character after numbers, as PRINT does to the screen. If you want to send several items, be sure that any needed delimiters, such as ",", are included.

Listening to a Device.

1. OPEN a BASIC file to the device's address.

2. Use INPUT# or GET# to fetch a line or a character from the IEEE bus.

3. Check the status word, ST, for an error, such as time-out. If the device is slow, the PET will complete the INPUT# or GET# and put a nonzero value into ST, which must be checked immediately after the I/O operation. If ST indicates a time-out, jump back to step 2.

4. Convert the data from the INPUT# or GET# as needed, and if more is needed, go to step 2.

Note that after each INPUT# or GET#, the UNT command is sent to the IEEE bus. This will truncate long messages from the device, especially with

GET#. Also note that INPUT# (string) and GET# (string) work the best. The BASIC string functions (MID\$, RIGHT\$, LEFT\$ and VAL) will help you get the data into a usable form.

Talking to More than One Device.

1. OPEN a file for each device.

2. Using CMD, send a dummy message to each device. For example, CMD 1:CMD 2:CMD 3 will set up each device (as specified in the OPENs for files 1, 2 and 3) by sending carriage returns to the devices and leaving them as listeners on the bus.

3. PRINT# to the IEEE bus. Any of the OPENed files may be used.

4. Repeat steps 2 and 3 as needed. Since PRINT# ends with the UNT, step 2 must be repeated after each PRINT#.

Transfer from One Device to Another.

1. OPEN a file for each device.

2. CMD to the device that is to be the listener.

3. INPUT# from the device that is to be the talker.

4. Repeat step 3 as needed.

INPUT# does not send a UNL, so the device that was CMDed remains on the bus as a listener. All information sent by the talker to the PET is also received by the listener. To turn off the listener, use a PRINT# to the listener's file. If the talker is slow, check ST and repeat step 3 as required.

Listing a BASIC Program to a Device

1. OPEN a file to the device.
2. CMD to the device.
3. Enter the LIST command.
4. When the LIST is finished, do a CLR.

The PET's graphics and cursor characters will not print correctly on a standard ASCII printer. (I have a BASIC listing program available.)

The best way to learn the PET files and IEEE 488 is by specific examples. After a detour through CMD, we will continue with two examples. These should provide you with enough information to get started. If you have no success, refer to the section on Common Errors (found later in this installment).

CMD

CMD is an unusual PET command. Consider its functions:

1. Anything that BASIC wants to say is now routed to the device that CMD's file number refers to. If this isn't the screen, nothing that BASIC says will appear on the screen.

2. If a list of variables and literals is provided after the CMD, they will be sent to the device in the same way as PRINT# will.

3. However, if the device is on the IEEE bus, no UNL will be sent, so the device will remain in the listening state and receive any following data sent on the IEEE bus.

To see how CMD operates, get two scratch tapes and enter the program in Example 1. Now SAVE and VERIFY this program on one of your tapes. Put the other tape in the tape unit and execute the following:

OPEN 1,1,1
PRESS PLAY & RECORD ON TAPE#1

Perform this and wait until the tape stops.

OK
READY.

```
10 REM CMD EXAMPLE
20 PRINT*****
30 OPEN 1
40 GET#1, A$
50 PRINT A$;
60 IF A$=CHR$(90) THEN PRINT*****:END
70 GOTO 40
80 REM Z
```

Example 1.

Now enter CMD 1. Note that READY. didn't appear; it was provided by BASIC and is now residing in the tape buffer. The cursor is blinking below the C in CMD. Continue with:

```
LIST
CLOSE 1
CLR
READY.
```

Note that the CLOSE 1 didn't get the READY. back. It took the CLR to return BASIC's messages to the screen. If you enter LIST, the program will appear on the screen. Rewind the tape and RUN. Three asterisks now appear after the RUN. These were printed by the program. This is one reason I don't trust my PET after a CMD. The text between the OK and the ending READY was found as a data file.

When the PET was under the influence of CMD, the letters you typed in were put onto the screen. This echoing is done by the PET's operating system, so CMD won't put these out to the device.

Though CMD looks like a good way to LIST program to tapes as data files, there is a snag. My example is shorter than 191 characters, and a LIST via CMD isn't smart enough to "jiffy" the data tape (this has been fixed on the new PETs). You run the risk of losing tape records when you try to read an "unjiffied" tape.

Try to verify that CMD 1, "HELLO OUT THERE" will print HELLO OUT THERE onto the tape. Remember that if you CMD a device on the IEEE 488 bus, any PRINT# to the bus will require a repetition of the CMD if you want the device to remain in the listening state.

Talking to the Clock Again

(For a description of the HP clock see part 1 of this article.)

First, you must check the device address on the DIP switch (which will be near the 488 female connector) and make sure the address is in the range 4 to 15. Then enter a short program (Example 2) into the PET. This program consists of three subroutines to facilitate communicating with the clock. Remember that the PET will not accept an INPUT statement as a direct

```
10 OPEN 1,7
20 RETURN
100 INPUT "SAY TO CLOCK:";S$
110 PRINT#1,S$
120 RETURN
200 INPUT#1,C$
210 PRINT "CLOCK SAYS: ";C$
220 RETURN
```

Example 2.

command.

First, enter GOSUB 10 as a direct command. This opens file 1 to device 7, which is our clock on the IEEE bus. OPEN merely sets things up; nothing is sent to the bus yet.

To read the time, enter GOSUB 200:

```
GOSUB 200
CLOCK SAYS: 0103020204 (Jan. 3, 2:02:04 AM)
```

Your PET might give ? SYNTAX ERROR after this operation. This is a harmless feature of the PET.

To set the clock, using Jan. 29, 9:17 PM, as our example, enter:

```
GOSUB 100
SAY TO CLOCK? R0000000000000000
D00000000000000000(28 Ds)
```

The clock starts at day 1. To set to day n, use n - 1 Ds. To set the hour, enter the following.

```
GOSUB 100
SAY TO CLOCK? H0000000000000000
H000000H(21Hs)
```

Minutes and seconds are set similarly.

```
GOSUB 100
SAY TO CLOCK? M0000000000000000
M000000SS (17Ms, 3Ss)
```

We are now set to 9:17:03. When I did this by hand, the clock moved forward about a minute, so the number of M's used should be changed to accommodate for this.

Talking to the HP 8165A Programmable Signal Source

(For a description of the HP 8165A, see part 1 of this article.)

The 8165A is a fine instrument with many switches, knobs, buttons and options and a correspondingly wide array of IEEE 488 commands (see Fig. 12, part 1).

The precise contents of each example concern the 8165A, which is an instrument you will probably never meet! My intention is to show you how direct

Stop fiddling with your cassette cables! Install our TBEEP and forget it forever!



TBEEP™ 1

For Level II and Disk Users — A self-contained audio alert beeper with a pager-like tone. Plugs in-line with "AUX" cable from your TRS-80 (Requires 9V Battery).

\$ 19.95

TBEEP™ 2

A TBEEP kit you install inside your TRS-80 keyboard.



- Completely assembled and tested.
- Attach to keyboard's PC board with double-sided foam tape (included) and solder three wires to easily located points on keyboard unit. Installs in minutes.
- Uses power from your TRS-80. No battery required.
- DEALERS! Install when modifying your customer's TRS-80, and include TBEEP's simple four word BASIC command in your off the shelf Software.

TBEEP 2 Kit (with complete instructions) \$ 12.95

Send Check or Money Order to:
Phone Orders:
(714) 760-9424
(714) 494-2869
Dealer Inquiries Invited
UPS/COD — Add \$3.00

WEB ASSOCIATES
MARKETING CENTER ✓ 28
95 Emerald Bay
Laguna Beach, CA 92651
(Calif. Residents add 6% tax)



SEND FOR FULL LINE CATALOG

A Quote on our new

Integrated Accounting System (IAS):

"...an excellent value—particularly good are the error checking and data entry procedures—documentation is good (both within the programs and separately provided materials)."

Mr. E. Lindow
Director of Computer Operations
Metric Industries

Some of the IAS features include:

Custom Chart of Accounts limited only by available memory (a 32K system will support up to 200 accounts including DOS and BASIC). Financial reports (service or manufacturing) including Income Statement with current and Year-To-Date totals, Balance Sheet and Worksheet. Provision for "Header" and "Subsidiary" accounts. Check register. Account balances at any time. Up to 1100 Accounts Receivable. AR includes read-to-mail bills, automatic aging of AR accounts and posting to General Ledger. Up to 1100 Accounts Payable with check printing. Payroll supports up to 200 employees and permits payment by week, bi-weekly, semi-monthly, monthly, hourly or on salary or any combination thereof. Prints paychecks and W2 forms. Maintains all employee data with full editing. Current, quarterly and Y-T-D employee totals. IAS includes over 30 reports and listings to give you the information you need when you need it. Over 65 programs in all!

Prices: General Ledger; \$125.00, G.L. plus 1 subsystem; \$225.00; G.L. plus 2 subsystems; \$300.00; G.L. plus AR, AP and Payroll subsystems; \$350.00. Manual for IAS is \$20.00 (credited towards purchase). Please include \$3.00 for First Class postage.

IAS requires 32K of memory, North Star Release 4 or later DOS and BASIC and two disk drives. Printer output is provided for, but not required. Specify video device when ordering.



ECOSOFT Phone orders only: (317) 253-6828
P.O. Box 68602 Indianapolis, IN 46268

mode commands—that is, BASIC statements without line numbers—can be used to control an instrument and help in debugging.

First, I hooked the 8165 to the 488 cable, and the PET turned on. The 8165 was addressed to 8. When the PET came on, IFC was true for about one second. This put the 8165 in local mode, where the front panel works as usual. Many instruments will ignore their front panels when the 488 bus addresses them. Once the PET addresses the 8165, you cannot control it from the front panel anymore. (An LED indicates this on the 8165.)

The following short program takes care of input from the instrument:

```
10 INPUT#1,A$
20 PRINT A$
```

This substitutes for the illegal direct command (INPUT#1,A\$: PRINTA\$), which I would like to use, but the PET forbids (try it and see!).

Since I wanted the 8165 to output a 1 kHz sine wave at an

amplitude of 1.5 volts, I used the following IEEE commands:

```
F1—Set to sine wave
FRQ 1 KHz—Set frequency
AMP 1.5 V—Set amplitude
I1—Set to normal operation
(contiguous signal output)
```

First, open the IEEE file:

```
OPEN 1,8
READY.
```

Then send the settings:

```
PRINT #1,"F1" (At this point, the
"Remote" LED went on, and I can no longer
work the front panel.)
PRINT #1,"FRQ1KHZ"
PRINT #1,"AMP1.5V"
PRINT #1,"I1"
```

Nothing happened! My scope showed only a flat trace! Upon reviewing my steps, I noticed that I overlooked the Disable Output (OD) and Enable Output (OE) commands. I entered PRINT #1,"OE", and a sine wave appeared on the scope.

You could also send this setting as one string. For example, PRINT #1,"F2FRQ1.2KHZAMP 1.2VIOE" sets up a 1.2 kHz triangle wave at 1.2 V amplitude.

The 8165 can also report some of its switch settings. Now

we can use the tiny program in the PET:

```
GOTO 10
F1 D2 I2 FM0 AM0
```

Since the PET has difficulty with GOSUB in direct mode and the IEEE bus, we must make a program change:

```
10 INPUT#1,A$
20 PRINT A$
30 RETURN
```

We will quickly be reminded that any time we change a program, all the variables, including opened files, will be lost:

```
GOSUB 10
?FILE NOT OPEN ERROR IN 10
```

So we try again:

```
OPEN 1,8
GOSUB 10
F1 D2 I2 FM0 AM0
?SYNTAX ERROR IN 22066
```

The PET will provide the ?SYNTAX ERROR about 90 percent of the time when the IEEE is accessed via the INPUT# statement and the PET is executing a directly called subroutine. However, this doesn't appear to affect anything. I avoided this by not making the little program a subroutine the first time.

So, if you are in a pinch, remember that the PET's direct command capability can rescue you with IEEE 488 devices and provides an inexpensive way to explore a new instrument.

Talking to More than One Device

Now that each of the instruments has been in the bus individually, the next step is to try the 488 with both of them on at the same time. I connected the HP clock and the 8165 to the 488 bus and gave the clock address #7, and the 8165 address #8. Then I entered the short program for INPUTS:

```
10 INPUT #1,A$
20 PRINT A$
30 END
100 INPUT #2,B$
110 PRINT B$
120 END
```

First, OPEN the files:

```
OPEN 1,7
OPEN 2,8
```

If you get a ?FILE OPEN ERROR, just enter CLR and start over.

Taking a peek at the clock resulted in:

```
GOTO 10
0130051957 (30 Jan., 5:19:57)
```

And peeking at the 8165 gets me:

```
GOTO 100
F1 D2 I2 FM0 AM0
```

which is the usual mystery message that the 8165 says to me. There isn't any point in explaining this message, for your instrument will say something different and meaningful only to you.

PRINT #1 and PRINT #2 will work just fine, and so two instruments and the PET can live in harmony together.

A Gotcha

I decided to turn off the 8165 with the PET set up for two instruments as described above. Sure enough, strange things happened.

The clock worked fine:

```
GOTO 10
0130052525
```

And just for fun, look what happens with the 8165 (which isn't on):

```
GOTO 100
F1 D2 I2 FM0 AM0
```

The 8165 has some internal batteries to store and memorize settings until it is turned on again. It also will respond to the IEEE 488 bus.

Now to try things in reverse—the clock doesn't have any batteries. (Clock is off; 8165 is on.)

```
GOTO 100
F1 D2 I2 FM0 AM0 The 8165 is fine
GOTO 10
F1 D2 I2 FM0 AM0 What's this?
```

The 8165 will reply to any address if it is the only device on the bus. The clock acts in the same way. (I don't know if this is a PET fault or an HP design decision. Check your device.)

If your program is intended for more than one device, this can be a disaster. Make sure all required devices are operating when using multiple devices on the bus.

I ran into another gotcha: the 8165 wouldn't accept every frequency change. I tracked this problem down to the presence of the HP clock on the bus. When I turned the clock off, everything worked fine. When debugging, remember to have only one device on your bus.

Common Errors

In theory, if you have under-

ANNOUNCING:

NEW!

MICROSTAT

A complete statistics package for business, scientific, education and research work. No other package has the features of MICROSTAT. For example:

- File oriented with COMPLETE editing
- A Data Management Subsystem for editing, sorting, ranking, lagging, data file transfers PLUS 11 data transformations (e.g., linear, reciprocal, exponential, etc.)
- Frequency distributions
- Simple and multiple regression
- Time series (including exponential smoothing)
- 11 Non-parametric tests
- Crosstabs/Chi-square
- Factorials (up to 1,000,000!), permutations, combinations
- 8 Probability distributions
- Scatterplots
- Hypothesis test (Mean, proportion)
- ANOVA (one and two-way)
- Correlation
- Plus many other unique features

Users manual: \$10.00 (credited towards purchase) and includes sample data and printouts. Uses NORTH STAR BASIC 32K of memory, one or two disk drives (2 recommended). Printer optional. Price: \$200.00



ECOSOFT

P.O. Box 68602
Indianapolis, IN 46268

✓83
Phone orders:
(317) 253-6828

MARK GORDON COMPUTERS

A DIVISION OF MARK GORDON ASSOCIATES, INC. ✓⁸⁴

15 Kenwood Street, Cambridge, Massachusetts 02139, (617) 491-7505

SORT-80

**Produced exclusively for
Mark Gordon Computers by SBSG**

TRS-80* disk files may be sorted and merged using SORT-80, the general purpose, machine language, sort program. Written in assembly language for the Z-80 microprocessor, it can:

- Sort files one disk in length
- Sort Direct Access, Sequential Access and Basic Sequential Access files
- Reblock and print records
- Recontrol files from disk
- Be executed from DOS
- Be executed from BASIC
- Be inserted in the job stream
- Allow parameter specification
 - input/output file specification
 - input/output record size
 - lower/upper record limit
 - print contents of output file
 - input/output file key specifiers

The minimum requirement is a 32K TRS-80* Level II computer with one disk drive or a single drive Model II computer. It will operate on 35, 40 and 77 track drives, and has been tested on TRSDOS 2.1, 2.2, 2.3, NEWDOS 2.1, 3.0, and VTOS 3.0.1. It is compatible with most machine language printer drivers. Sort time is fast; for example, a 32K file will sort in approximately 40 seconds. **\$59.**

PCS

Program Catalog System from SBSG

This menu driven system provides the TRS-80* user with a computerized method to keep track of all programs and data files. The idea is to build and maintain on a file a disk detailing each program including program name, size, creation date, and a brief narrative as to function. Programs are provided to:

- create, update, or display
- print in disk number order
- print in alphabetical order
- print file listing
- create a file automatically

With a 32K system you can catalog 150 programs; with a 48K system you can catalog 300 programs; or you can catalog 650 programs without sort. **\$29**

*TRS-80 is a registered trademark of Radio Shack, a division of Tandy Corp.

InfoBox

The information manager

InfoBox is the easiest-to-use information manager available for the TRS-80*. It's ideal for keeping track of notes to yourself, phone numbers, birthdays, inventories, bibliographies, computer programs, music tapes, and much more. This fast assembly language program lets you enter free-format data, variable length items and lets you look up items by specifying a string of characters or words that you want to find. You can also edit and delete items. Items entered into InfoBox can be written to and read from cassette and disk files. All or selected items can be printed on a parallel or serial printer. InfoBox occupies 3K. Specify cassette or disk version. Special introductory price **\$24.95** until June 15; **\$29.95** after.

DEBUG+

The ultimate monitor/disassembler

Compare the features and price of **DEBUG+** with other monitor/disassembler programs. It offers nine true, single-byte breakpoints, single step program execution, hex and decimal arithmetic including multiply and divide and conversions, ASCII dump that distinguishes all 256 codes, disassembly to screen and printer in full Zilog mnemonics, and register set command. It also has the usual port I/O, hex and decimal memory dump, change, move, copy and exchange memory features offered by others. Ideal for the user who wants to experiment with assembly language or to write subroutines to call from BASIC; essential for the serious programmer. Special introductory price **\$24.95** to June 15; **\$29.95** after.

FMS

File Management System by SBSG

This menu driven program allows you to define and create files for your own use. You can:

- sort these files in:
 - ascending order
 - descending order
 - on up to 3 separate fields
- scan the files
- summarize any numeric or dollar data fields
- print the field records
- create, add to or delete field records

\$49.00

Model II versions of SBSG software available. Dealer inquiries invited.

stood everything to this point, you can now get an IEEE 488 instrument and make it play with your PET. In practice, this won't happen.

Finding errors is the hardest part of programming, and when you work with the IEEE bus, you can make many mistakes that don't look like errors. When you are able to see errors easily and immediately, you won't need this article.

Here is an incomplete list of the common errors in wait for the unwary IEEE/PET programmer.

The misplaced address. The PET's IEEE addresses are from 4 through 30. The addresses 0 to 3 are reserved for the PET's other I/O devices:

- 0—Keyboard
- 1—Tape unit #1
- 2—Tape unit #2
- 3—Video screen

If you OPEN a file to the reserved addresses, you won't be speaking to the IEEE bus!

If a device isn't running when the PET wants to talk to it, you will usually get a ?DEVICE NOT PRESENT ERROR. However, if some other device is operating on the bus, you might get the other device's response instead. This happened to me with the HP clock and the 8165. If one was turned off, the other would respond, even though the OPEN statement was referring to the inactive device. This can badly confuse your program.

Time-outs. The PET will only wait for 64 milliseconds before giving up on a device that is slow to respond to the IEEE 488 handshake. Though the IEEE 488 is supposed to work at any speed, you may wonder what to do if a device on the bus has failed. If the PET were to wait for a response, there would be no way to return to the user. The 64 ms interval was chosen from the timers available on the 6522 VIA chip, which can count up to 65535 at the 1 MHz clock rate of the PET.

Most instruments will respond within the 64 ms interval, and the PET will read and write the data correctly. This was true of the HP instruments at my disposal. To exercise the PET time-

outs, I attached both the clock and the 8165 to the bus, and then OPENed a file to a nonexistent address:

NEW

```
10 INPUT#3,A$
20 IF ST THEN PRINT"ST IS" ST
30 PRINT A$
40 A$=""
```

OPEN 1,7 (Open the clock to file 1)

OPEN 2,8 (Open the 8165 to file 2)

OPEN 3,10 (The nonexistent device)

The little program attempts to input from the nonexistent device. The ST value is a reserved BASIC variable used by the PET for indicating I/O conditions. If ST isn't zero, something went awry.

Now to talk a bit to the devices to wake them up:

```
PRINT #1,"R" (And the clock resets)
PRINT #2,"E0" (And the 8165 puts out a signal)
```

If a look at ST is made, all's well:

```
PRINT ST
0
```

This may take a few tries to work right.

Now to try that nonexistent device:

```
PRINT #3,"HELLO"
```

Looks OK, right? Well, let's see . . .

```
PRINT ST
-128
```

This is the PET's ST code for "device not present."

Now to try the little program:

```
GOTO 10
ST IS 2
```

READY.

The ST code is 2, which is the time-out for reading data; the nonexistent device didn't say anything. Recall that line 30 said to print A\$. The PET *did* print A\$, which was an empty string.

The solution to this dilemma is to keep on trying! Write a loop that redoes the INPUT# or PRINT#. In most cases, a slow device will send its characters rapidly enough—once it has its message ready.

Consider these two sample loops:

```
100 PRINT #5," some message or other"
110 IF ST=1 THEN 100
200 INPUT #6,B$
210 IF ST=2 THEN 200
```

If you want to mask for certain bits, you can use the AND

The PET IEEE 488 File I/O Statements

The PET sees the IEEE 488 bus as a file, and the file I/O statements apply to IEEE 488 transfers. Be sure you know the cassette file I/O before tackling the IEEE 488 bus.

The PET file I/O statements are:

● OPEN (file number), (device number), (secondary address), (filename)

OPEN instructs the PET to associate the file number with the desired I/O device. BASIC uses the file number in its PRINT#, INPUT# and GET# statements to determine where the I/O is to take place. The file number may be from 1 to 255.

The device numbers are assigned as follows:

- 0—Keyboard
- 1—Cassette unit #1
- 2—Cassette unit #2
- 3—Screen
- 4—30 IEEE 488 bus

This implies that your IEEE device must be addressed in the range of 4 to 30. Most IEEE devices have a switch or jumpers that permit the changing of their addresses.

The secondary address and filename are optional. However, if you want to use the filename, the secondary address must also be included. The secondary address has the range of 0 to 31.

If the filename is not specified, the OPEN statement sends nothing to the IEEE 488 bus. When BASIC sees the PRINT#, INPUT# and GET# statements, the device number (and secondary address, if specified) are put on the IEEE bus as part of the usual transfer sequences.

If a filename is specified, (i.e., A\$ or "SOME NAME"), the OPEN statement activates the IEEE bus making ATN true and sends:

LISTEN (to the appropriate device)

SECONDARY ADDRESS (Ored with 11110000)

FILENAME (all characters)

This permits suitably complex command sequences that require ATN to be true to be sent. If the command sequence has to be repeated later, CLOSE the file and OPEN it again. I haven't been able to check if the above assertions about the filename are true. If you have a bus analyzer, check this out!

● PRINT# (file number), (values to be sent)

First, don't use the abbreviation ?# ; it won't work (when executed, you will see ?SYNTAX ERROR) and will list as PRINT#. Spell out PRINT completely!

The PRINT# sets ATN true and sends the device number as a LISTEN address. If a secondary address as specified, it will be sent also. The device number and secondary address are taken from the appropriate OPEN statement.

ATN is then made false, and the values to be sent are transmitted as ASCII characters in exactly the same way as they would be sent to the screen. For example, if a number is sent, a cursor right character follows the last digit. If you use "," to separate columns, lots of cursor rights are sent. If the PET feels a number should be in scientific format (i.e., 1.53E-07), that's what is sent! EOI is made true with the last character of data sent.

After the values are sent, an UNLISTEN is sent (with ATN true), and all listening devices are set free.

● INPUT# (file number), (values to be input)

INPUT# sets ATN true and sends the device number as a TALK address. If a secondary address was specified, it will be sent too. The pertinent OPEN statement is used for these values.

ATN is then made false, and the PET accepts characters from the device to the PET's input buffer. If the talker activates EOI, a carriage return is added to the end of the buffer.

After the characters are accepted and carriage return or EOI is recognized, the PET sets ATN true and sends an UNTALK, which releases the device.

BASIC then scans the input buffer in the same way that an ordinary INPUT statement looks at what is typed in. This means that commas and quotes will have the same effects as with normal INPUT. It is best to use an INPUT (string) form and hope your device doesn't send any commas!

As with cassette INPUT#, an 80-character buffer is used. If more than 79 characters arrive without a carriage return, the PET will go into "limbo," and all is lost. (New PETs have this fixed. Over 80 characters are ignored (or worse, the buffer is initialized, and the first 80 characters are lost!). If you have a new PET, try it with cassettes and find out what happens.

INPUT# is susceptible to "time out," and ST should be checked for a time out. Repeat the INPUT# if a time out is detected.

operator, but parentheses are needed. The above examples would read:

```
110 IF (ST) AND 1 THEN 100 and
210 IF (ST) AND 2 THEN 200
```

The removal of the parentheses makes the PET see the expression as:

```
IF ST AND 1 looks like IF S TAN D 1
which will result in a ?SYNTAX
```

ERROR. Use parentheses or rearrange the order of operations in these cases.

The literal principle. PET outputs to a file the same characters that it sends to the screen. This is also true for the IEEE 488. The PET's format for PRINTing a number is:

(space or - sign) (digits) (optional exponent) (cursor right)

any numbers sent to the IEEE 488 bus.

The following program sets the frequency of the 8165.

```
10 OPEN 1,8 (The 8165 is at address 8)
20 FOR J = 1000 TO 2000 STEP 10
30 PRINT #1,"FRO"J"HZ"
40 FOR K = 1 TO 1000
50 NEXT K (This is a 3 second delay loop)
60 NEXT J
```

When this is RUN, the 8165 gives all signs of distress. The frequency appears on the front panel, but the LED that indicates correct entry stays blinking (not completed). Also, the scope shows no change. The PET screen blinks at intervals, indicating that EOI is made true now and then. (I suspect the instrument is making this hap-

pen.)

The following modification will fix this:

```
30 PRINT#1,"FRO"STR$(J)"HZ"
```

The STR\$ function converts a number to the string that would be PRINTed, without the cursor right at the end! The general fix for numbers is simple: convert all numbers to strings before putting on the IEEE 488 bus.

Fractions. Now that the frequency example is working right, how about trying some other STEP sizes. Here is a simple change:

```
20 FOR J = 1 TO 2 STEP .01
30 PRINT #1,"FRO"STR$(J)"KHZ"
```

The J loop was changed to do the same thing, but in kilohertz.

Line 30 was changed to reflect this. When RUN, it all works fine until about 1.25 kHz—the 8165 now shows 1.259 kHz instead of 1.260. A look at J gives us the clue we need:

```
BREAK IN 40 (Press STOP key)
PRINT J
1.25999999
```

The PET slips up when computing with fractions... and this eventually shows up. The fraction .01 becomes a repeating binary decimal, and after repeated addition, the round-off appears as a slight reduction of the number being added to. In this case, 1.260 turns into 1.25999999.

Catching this is easy... if J were put onto the screen first!

```
35 PRINT STR$(J)
```

If you do this, the first "blow up" comes at 1.22999999. Now you are faced with a programming problem: how to get around nasty numbers. One way is to take the INT function, such as:

```
STR$(INT(J*100+.5)/100)
```

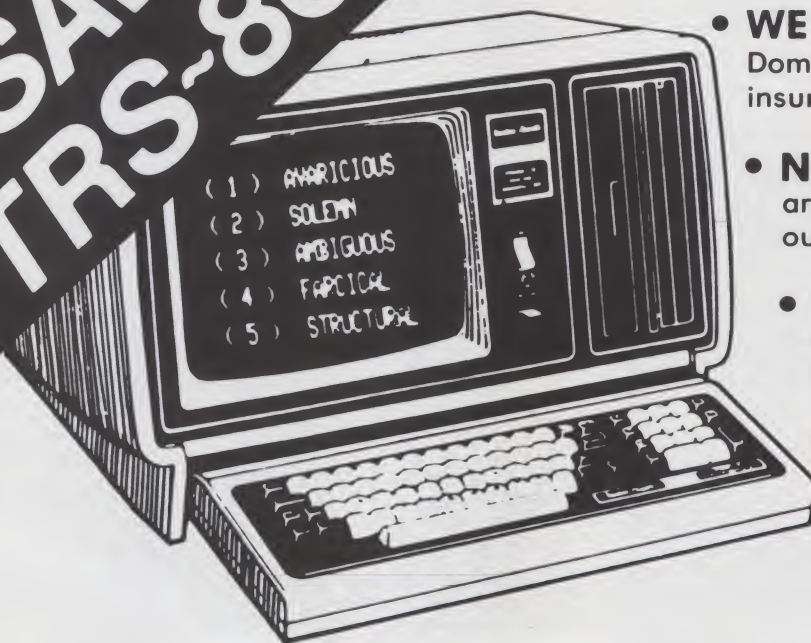
which rounds the number in the hundredths place. More complex tricks will be needed if the PET insists on scientific notation, such as

```
2.35E-03
```

PRINT your IEEE output onto the screen while debugging.

Next month, we will wrap up our three-part series with a further look at the programming style with the IEEE 488. ■

SAVE
TRS-80's



- **DISCOUNTS**
of 10%, 15% and more available.

- **WE PAY**
Domestic U.P.S. shipping and insurance on minimum orders.

- **NO TAXES**
are collected on out-of-state shipments

- **TOLL FREE**
Order Number 800/531-7466.

- **OPEN**
8:00 a.m. to 6:00 p.m.,
Central Time,
Monday through Friday;
9:00 a.m. to 6:00 p.m.,
Saturday.

Pan American Electronics Incorporated

A **Radio Shack** 
AUTHORIZED SALES CENTER



1117 CONWAY MISSION, TEXAS 78572
TOLL FREE ORDER NUMBER 800/531-7466

TEXAS AND PRINCIPAL TELEPHONE NUMBER 512/581-2765





**PERSONAL
COMPUTER
SYSTEMS**

ATARI® 800™

List \$1080

ONLY \$849



ATARI® 400™, List \$630

OUR PRICE ONLY \$499

820 PRINTER, List \$599.95 \$499

810 DISK DRIVE, List \$699.95 \$589




HP-85

Call for Price

- Extended BASIC Language
- Advance Graphics
- CRT Built-In Display
- Magnetic Tape Cartridge for Storage

CALCULATORS BY

HEWLETT  PACKARD

- HP-41C Calculator, "A System" ... \$289.95
- HP-32E Scientific w/Statistics ... \$ 53.95
- HP-33C Scientific Programmable ... 99.95
- HP-34C Advanced Scientific Programmable 123.95
- HP-37E Business Calculator 58.95
- HP-67 Handheld Fully Advanced Programmable Scientific for Business & Engineering 298.95
- HP-97 Desktop w/Built-in Printer .. 579.95

- APPLE II, 16K, List \$1195 \$ 989
- 32K, List \$1395 \$1169
- 48K 1259

COMMODORE PET Call for Prices

Prices do not include shipping by UPS. All prices and offers are subject to change without notice.

**Personal
Computer
Systems**



✓ 303

**609 Butternut Street
Syracuse, N.Y. 13208
(315) 478-6800**

YOU'RE FACE-TO-FACE WITH EVIL

It's Morloc The Wizard, the evil master of mayhem and illusion. He's threatening the village of Hagedorn. Your mission is to kill Morloc and save the village in this dangerous REALTIME computer game from Automated Simulations. Morloc lives in a 30-room Tower, where his minions and monsters do his bidding to create terrible hazards for you. You'll be attacked by Ogres, The Creeping Crud, Fire Elemental, Vampire Bats, Salamanders and his personal Genie. The fiend will even throw his devastating Fireballs at you.

And, just when you think you have him in your grasp, he'll teleport away.

He's fearsome and lethal.

If you can find the magical treasures in the Tower, you might be able to turn them against Morloc. Try to find them. Then, if you do, try to decipher their meaning and use them. Even worse, you're in REALTIME!

If you have a 24K PET, 16K TRS-80, or 48K APPLE, you can play "MORLOC'S TOWER" and come face-to-face with absolute evil.

**Fantasy
at Your
Fingertips** T.M.

HERE'S HOW YOU CAN TOUCH YOUR FANTASIES: Ask your dealer or rush \$19.95 in check or money order to Automated Simulations, Dept. TW1 P.O. Box 4232, Mountain View, CA 94040.

Or, call our FANTASY LINE, toll free, 800-824-7888, Operator 861 to place your order and to tell us what other fantasies you would like to touch. (California, call 800-852-7777, Operator 861. Alaska and Hawaii, call 800-824-7919, Operator 861.)



**AUTOMATED
SIMULATIONS** ✓ 55

I want to TOUCH my fantasies...Rush me "MORLOC'S TOWER" for \$19.95 (CA. residents add 6%)

I have: PET ☐ TRS-80 ☐ APPLE ☐

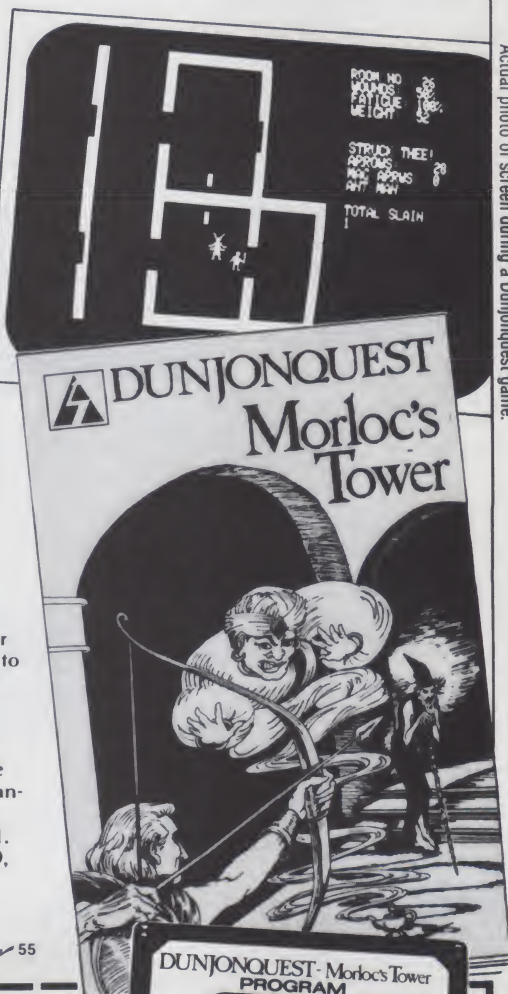
Payment enclosed _____ Bill my VISA ☐ M.C. ☐

Account # _____ Expires: _____

Name _____

Address _____

City _____ State _____ Zip _____



Actual photo of screen during a Dunjonquest game.

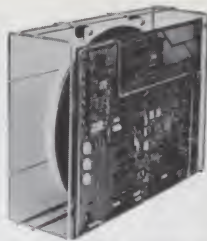


GUARANTEE

If I'm not completely satisfied, I will send "MORLOC'S TOWER" back to you in 10 days for a full refund.

© 1979, Automated Simulations

PRIAM Hard Disks Now Available from SIRIUS SYSTEMS!



PRIAM's high-performance, low-cost Winchester disc drives speed up throughput and expand data storage from 20 megabytes to 154 megabytes. And a single controller can be used to operate 14-inch-disc drives with capacities of 33, 66, or 154 megabytes or floppy-disc-size drives holding 20 and 34 megabytes. So it's easy to move up in capacity, or reduce package size, without changing important system elements or performance.

- Fast, Linear Voice Coil Positioning
- 10 ms track-to-track positioning
- Fully servoed head positioning
- Dedicated servo tracks
- DC Power required only!
- Simple, parallel Interface
- Optional SMD Interface
- 50 ms Average Positioning time
- 90 ms Maximum Positioning Time
- 6.4 ms Average Latency

THE PRIAM LINEUP

Model/Disk Size	Capacity	Size	Weight	Price
DISKOS 3350 (14")	33Mbytes	7" x 17" x 20"	33 lbs.	\$2995
DISKOS 6650 (14")	66 Mbytes	7" x 17" x 20"	33 lbs.	\$3749
DISKOS 15450 (14")	154 Mbytes	7" x 17" x 20"	33 lbs.	\$4695
DISKOS 2050 (8")	20 Mbytes	4.62" x 8.55" x 14.25"	20 lbs.	\$2995
DISKOS 3450 (8")	34 Mbytes	4.62" x 8.55" x 14.25"	20 lbs.	\$3745
DISKOS 570	5.3 Mbytes	floppy-size	(low)	(low)
DISKOS 1070	10.6 Mbytes	floppy-size	(low)	(low)

All PRIAM DISK Drives have a Transfer Rate of 1.03 Mbytes/Sec. Optional SMD interface available for \$150.

SIRIUS SYSTEMS offer cases and enclosures for all PRIAM Hard Disk Drives. All 14" Winchester Drives will mount in our 14" Standard Case. The 8" Winchesters have two alternatives: a single drive case and a dual drive case. All SIRIUS SYSTEMS Winchester drive cases include Power Supply, internal cabling, switches, fan, extra AC outlet (not switched, but fused) and possess very adequate ventilation. Drive addressing is done on the rear of the Case and not on the drive itself to provide ease of use during operation. All WINCHESTER DRIVE Cases are Warranted for a full year and come in our standard blue-black color scheme. Consult us for current availability and pricing.

Remex RFD 4000/4001 8" Floppy Disc Drives Double sided ... Double density!!

\$549⁹⁵

RFD 4001, \$569.95

Offers quality and features found in drives costing much more! ■ Single or Double Density ■ Double-Sided Drive ■ Door Lock INCLUDED ■ Write-Protect INCLUDED ■ 180 Day Warranty ■ Compatible with Shugart 850/851 ■ Low Power Operation ensures LONGER LIFE!! ■ Model RFD 4001 offers Data and Sector Separator

RFD 4000/4001 Technical Manual	6.95	RFD 4000C/B Cabinet (for use with Power Modules)	29.95
Connector Set #3 (AC, DC, Card Edge)	10.95		
Connector Set #4 (AC and DC)	2.95		

Remex 1000B ... If you've been looking for a less expensive floppy disc drive, but not wanting to sacrifice quality — this is it!

\$419⁹⁵

You get both in the Remex 1000B! For only \$419.95 look at what you get: ■ 8" Floppy Drive ■ Single or Double Density ■ Hard or Soft Sectoring ■ Media Protection Feature ■ Single Density Data Separator ■ 180 Day Factory Warranty

Door Lock Option	19.95	Write Protect Option	19.95	RFD 1000B Technical Manual	5.95
Interface Adapter (REMEX-to-Shugart)	14.95	Connector Set #1 (AC, DC, & Card Edge)	10.95	RFD 1000B CASE (for use with Power Modules)	29.95

SIRIUS 8" DISK POWER MODULES

The Single and Dual Drive Power Modules are designed to provide DC and (switched) AC power for one (the Single Drive Power Module) or two (the Dual Drive Power Module—the DDPM will power three RFD 4000s or 4001s) 8" Floppy Disk Drives. Many features are included for safe and reliable operation and the Power Modules come with our stan-

dard 180 day WARRANTY (the Open Frame Power Supply warranty is for 2 years). All Power Modules will work with either the RFD 4000C/B or RFD 1000B case (color schemes match also).

Dual Drive Power Module (DDPM)	139.95
Single Drive Power Module (SDPM)	119.95

SIRIUS 80+ Perfect Add-Ons for Your Computer System!



The SIRIUS SYSTEMS 80+ Series of Floppy Disk add-ons are designed to provide unmatched versatility and performance for your computer. Consisting of four different add-ons, there is a 80+ Series Floppy Disk to meet your need. All 80+ Series Floppy Disk are compatible with the TRS-80+ and come ready to plug in!

COMMON CHARACTERISTICS

- 5 ms track-to-track access time
- Auto-eject
- 180 day WARRANTY
- Exceptional speed stability — 1 1/2%
- Single density (FM) or double density (MFM/MCFM)
- Ultra high reliability
- 2 year Power Supply Warranty
- Mix any or all 80+ Series on the same cable!
- Includes user accessible plugboard for drive reconfiguring

SPECIFIC CHARACTERISTICS

The SIRIUS 80+1 is a single sided, 40 track, highly reliable Floppy Disk add-on. Offering 5 more tracks than the Radio Shack model, it cost \$140 less! Formatted data storage is 102K/20K bytes single/double density.

SIRIUS 80+1 \$359.95

The SIRIUS 80+2 is a dual sided, 70 track (35 per side), highly versatile Floppy Disk unit. It appears to be the TRS-80+ as TWO 35 track drives, yet COST LESS THAN HALF THE PRICE! Even greater savings result, since data is recorded on both sides of the media instead of only a single side. Using the plug board, it may be reconfigured for other computer systems! (The 80+2 operates as Drive 0 and any of the other three addresses (with the standard Radio Shack Cable) or as any of four drives (with the SS Standard Cable).) Formatted data storage is 80.6K/161.2K bytes single/double density.

SIRIUS 80+2 \$449.95

The SIRIUS 80+3 is a single sided, 80 track, "Quad" density Floppy Disk unit. Offering 2 1/2 times the storage of a Standard Radio Shack drive, the 80+3 greatly reduces the need for diskettes correspondingly. Additionally, because of the increased storage and faster track-to-track access time, the 80+3 allows tremendously increased throughput for disk based programs!!! The 80+3 INCLUDES SIRIUS's TRAKS-PATCH on Diskette. Formatted data storage is 204K/408K bytes single/double density.

SIRIUS 80+3 \$489.95

The SIRIUS 80+4 Floppy Disk add-on is a double sided, 160 track (80 per side), 5 1/4" monster! The ultimate in state-of-the-art 5 1/4" Floppy Disk technology, to 80+4 is seen by the TRS-80+ as two single sided disk drives, each with 80 tracks. Thus, in terms of capacity one 80+4 is equivalent to 4% standard Radio Shack drives — a savings of over 73% (not to mention diskettes!!!). (With a double density converter, the available memory is huge!) The 80+4 is similar to the 80+2 in that it arrives configured as Drive 0 and any of the other three addresses (with the standard Radio Shack Cable) or as any of four drives (with the SS Standard Cable). The 80+4 INCLUDES TRAKS-PATCH on Diskette. (The plug board is also included.) Formatted data storage is 408K single density or 816K bytes double density.

SIRIUS 80+4 \$624.95

All 80+ Series Floppy Disk add-ons operate a 5 milliseconds track-to-track access time (eight times faster than the SA 400) but are Expansion Interface Limited to 12 milli-seconds for the TRS-80+.

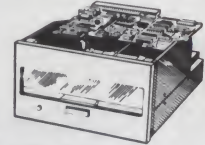
*TRS-80© Tandy Corp.

MPI 51/52 ... A Great Reliable Mini-Drive!

- Fast! 5ms track to track access
- Exclusive Pulley-Band Design
- Unique Door/Ejector Mechanism
- Reliable 1 1/2% Speed Stability
- Single/Double Density Operation
- Industry/ANSI Standard Interface

MPI 51
(Single Head, 40 tracks, 120K/240K bytes Single/Double Density**) \$259.95

MPI 52
(Dual Head, 70 tracks, (35/side), 218.8K/437.5K Single/Double Density**) \$349.95



MPI 91/92 ... NEW STATE-OF-THE-ART DISK DRIVE!

MPI 91
(Single Head, 80 tracks, 240K/480K Single/Double Density**) \$389.95

MPI 92
(Single Head, 160 tracks (80/side), 480K/960K Single/Double Density**) \$499.95

**Unformatted data storage

Introducing the Versatile, Low-Cost OMEGA Series Controller

As new technological advances bring down the cost of fast, reliable mass data storage, the need for an inexpensive, versatile controller have become greater and greater. To meet this need, SIRIUS SYSTEMS' OMEGA Series Controller was designed.

The SIRIUS OMEGA Series Controller Module utilizes an on-board microprocessor to mediate data transfer to a wide variety of peripherals from an equally wide variety of host computer systems. Up to four Winchester Hard Disks (8" or 5 1/4"), four 5 1/4" Floppy Disk Drives and/or up to eight 8" Floppy Disk Drives may be in use at one time. Host systems interfacing is accomplished via a parallel or a serial interface. With the addition of a Personality module, the OMEGA Series Controller Module is directly compatible with many popular computer systems (among them the TRS-80+, Apple, Heath, and others). Provision is made for the addition of a streaming tape drive, also.

SPECIFIC HARDWARE

FEATURES INCLUDE:

- Control of up to twelve Floppy Disk Drives (eight 8" and/or four 5 1/4")
 - 8" and/or 5 1/4" Disk Drive Utilization
 - Single (FM) or Double (MFM) density data storage
 - Hard or Soft sector diskette usage
 - Utilization of "Quad" density (96 tpi) 8" or 5 1/4" Disk Drives
- Control of up to four WINCHESTER type PRIAM DISKOS Disk Drives
 - 8" or 14" may intermix on the same cable
 - Accommodates 8" and/or 14" drives of 5.3Mbytes to 154Mbytes
 - Ultra-Fast data transfers
 - Extremely flexible host-controller interfacing

SPECIFIC SOFTWARE

FEATURES INCLUDE:

- Dynamic format modifications via command words
- Extremely flexible format acceptance for unusual data storage formats
- Easily interfaces to standard operating systems (TRS-DOS*, CP/M***, etc)
- Operates in either get/put sector mode or data string mode
- Performance parameters may be changed by EPROM replacement or Dynamic Reprogramming

Dedicated systems cards are also available on a limited basis for the STD-BUS and the S 100. These cards feature shared memory also (again, software selectable) in addition to the regular OMEGA Series Controller Module features. Consult SIRIUS SYSTEMS for current price and availability for the entire line of OMEGA Series Memory Units and Controllers. Dealer inquiries are invited.



SIRIUS SYSTEMS

7528 Oak Ridge Highway
Knoxville, Tennessee 37921

TO ORDER CALL (615) 693-6583

Phone Orders Accepted 9AM-7PM (ESDT)

We accept MC, VISA, AE, COD (requires Certified Check, Cashier's Check or Cash) and Checks (personal checks require 14 days to clear). **SHIPPING AND HANDLING: \$7.00 per Floppy Disk Drive or 80+ Module** ■ 5% for other items (any excess will be refunded) ■ **Foreign Orders add 10% for Shipping & Handling.** Payment in U.S. currency ■ Tennessee residents add 6% Sales Tax ■ **VOLUME DISCOUNTS AVAILABLE**

Some Tips on Program Conversions

Lessons learned from converting a personal bookkeeping system.

Linda E. Bjelland
2288 Hollygrove Rd.
Memphis, TN 38138

A lot of software is available, but often it has to be converted from one system to another. I recently completed my first programming project on my new TRS-80 Level II 32K disk system, and it happened to be a conversion. It was an excellent tool for learning about my system and its capabilities. The program I converted was "Keepbook," a small personal-bookkeeping system written in North Star disk BASIC by Robert L. Marx (June 1979, issue, p.60).

My husband and I hoped to use our TRS-80 for household bookkeeping, but the financial systems we looked at were too complicated. "Keepbook" met our requirements and provided a good vehicle for me to learn something about using TRSDOS to handle disk files. The conversion took longer than I expected, but in the end I had a useful program.

As I completed the program and reviewed what I had done, I began to formulate some thoughts about conversion in general. Here are some of my rules; I'm sure you'll think of your own to add, based on your own experience with program conversions.

Understand the program before you try to convert it. It is surprising how often this rule is ignored. You should make sure

that you understand specifically what the program is supposed to do. If the program came from a magazine or newsletter, there is probably an article or letter that explains its functions. Read it carefully, look at any examples that are provided and get a good functional feel for the program. If the program came from a "friend of a friend who has this terrific system..." get a sample run if possible, and get the name of the original author. If these aids aren't available (and sometimes even if they are), you are reduced to examining the code to discover the program's true functions. These are the times you pray for excellent documentation in remarks.

You should also know exactly what the program *doesn't* do. You may save yourself considerable time and effort converting something you won't use, or you may decide that it does some of what you want, but you prefer to write your own program.

Make a list of syntax substitution rules. You will probably do this, at least mentally, while you're reviewing the code. As long as you're thinking about it anyway, write it down. Many of these will be simple one-for-one substitutions. For example, in the published version of "Keepbook," a ¢ sign separated statements on the same program line; I had to replace this with a colon every time it occurred in my TRS-80 system. Some of the

replacement rules may be more complicated to figure out.

In "Keepbook" I encountered the statement `B9$=CHR$(26)` and, later, in several locations, `PRINT#DO,B9$`. From the author's remarks and the context, I soon figured out that the function was to clear the screen, for which I could use the `CLS` instruction. More complicated syntax and system differences may require rewriting sections of the code. I had to totally rewrite "Keepbook" disk I/O for the TRS-80, since TRSDOS handles random disk files with a different set of commands and formats than the North Star system.

Key in and run the program without any functional changes. Make only those syntax and technical changes you have on your list as you key in the program. Resist urges to make "small improvements"—adding a clarifying field to a display here, changing a variable name there. It is important to verify that you have a piece of code that performs the functions that you expect it to. If you fool with the code before it's tested, you may never know if the original version worked or not.

Carefully check and verify the output of this test run. Do not assume that because you received a display in the ex-

Keepbook program.

```
100 'KEEPBOOK BOOKKEEPING SYSTEM VERSION 1.0 JUNE, 1979
200 'ADAPTED FOR THE TRS-80 BY LINDA E. BJELLAND
300 'FROM A NORTH STAR SYSTEM BY ROBERT L. MARX
400 'PUBLISHED IN KILOBAUD MICROCOMPUTING, JUNE, 1979
500 'INITIALIZATION
600 CLEAR 250
700 CLS
800 DIM T$(35),F$(8),O$(1),T2$(50),L9$(30),L8$(62)
900 PRINT:PRINT:PRINT TAB(15);"'KEEPBOOK' BOOKKEEPING S
    YSTEM":PRINT
1000 PRINT TAB(24);"OPTIONS ARE:":PRINT
1100 PRINT TAB(5);"1=CONSTRUCT NEW FILE","2=START NEW Y
    EAR"
1200 PRINT TAB(5);"3=START NEW MONTH","4=ADD EXPENSE EN
    TRIES"
1300 PRINT TAB(5);"5=PRINT MONTHLY SUMMARY","6=H E L P"
1400 PRINT TAB(5);"7=PRINT SOURCE SHEET","8=QUIT"
1500 INPUT "OPTION = ";O
1600 IF O = INT(O) THEN 1700:PRINT "ERROR - MUST BE IN
    TEGER":GOTO 900
1700 IF O>0 AND O<9 THEN 1800:PRINT "ERROR":GOTO 900
1800 ON O GOTO 2000,4600,6000,7200,9400,12400,1430
    0,14000
1900 REM *****
2000 REM OPTION = CONSTRUCT FILE
2100 CLS:PRINT:PRINT:PRINT TAB(5);"CONSTRUCT NEW FILE"
2200 INPUT "HOW MANY ACCOUNTS ARE THERE ";A1
2300 IF A1<=0 THEN PRINT "MINIMUM 1":GOTO 2200
2400 MD$="N":GOSUB 15800
2500 LSET T1$(0)=MKI$(A1):LSET AC$(0)=MKI$(1)
2600 LSET S1$(0)=MKI$(1)
```



```

2700 FOR I%=1 TO A1
2800 GOSUB 18500
2900 CLS:PRINT:PRINT:PRINT "TITLE FOR ACCOUNT NR";I%;;I
      NPUT T$
3000 INPUT "IS THIS AN EXPENSE(E) OR INCOME(I) ACCT";O$
3100 IF O$="I" THEN S1=1 ELSE IF O$="E" THEN S1=-1 ELSE
      3000
3200 LSET TI$(SR%)=T$
3300 LSET AC$(SR%)=MKI$(I%)
3400 LSET SI$(SR%)=MKI$(S1)
3500 LSET CT$(SR%)=MKD$(0)
3600 LSET YT$(SR%)=MKD$(0)
3700 IF SR%=3 THEN PUT 1,PR%
3800 NEXT I%
3900 PUT1,PR%
4000 REM FILE STRUCTURE:NR ACCTS,HIGHEST ENTRY LINE,LOW
      EST E.L.
4100 REM TITLE/ACCTNR/EXPTYPE/CURRENT$/YTD$
4200 INPUT "FILE IS BUILT. HIT 'ENTER' TO CONTINUE";O$
4300 CLOSE 1
4400 CLS:GOTO 900
4500 REM *****
4600 REM OPTION = START NEW YEAR
4700 MD$="U":GOSUB 15800:GOSUB 18300
4800 LSET AC$(0)=MKI$(1):LSET SI$(0)=MKI$(1)
4900 FOR I%=1 TO A1
5000 GOSUB 18500
5100 LSET CT$(SR%)=MKD$(0):LSET YT$(SR%)=MKD$(0)
5200 IF SR%=3 THEN PUT 1,PR%:GET 1
5300 NEXT I%
5400 PUT 1,PR%
5500 CLS:PRINT:PRINT:PRINT "FILE ";F$;" IS SET FOR NEW
      YEAR"
5600 PRINT "BE SURE TO START A NEW SEQUENCE OF LINE ITE
      MS AT ONE"
5700 CLOSE1
5800 INPUT "HIT 'ENTER'";O$:CLS:GOTO 900
5900 REM *****
6000 REM OPTION =NEW MONTH
6100 MD$="U":GOSUB 15800:GOSUB 18300
6200 FOR I%=1 TO A1
6300 GOSUB 18500
6400 LSET CT$(SR%)=MKD$(0)
6500 IF SR%=3 THEN PUT 1,PR%:GET1
6600 NEXT I%
6700 PUT 1,PR%
6800 GET1,1:GOSUB 18300:LSET SI$(0)=MKI$(L1-1):PUT 1,1
6900 CLS:PRINT:PRINT:PRINT "FILE ";F$;" SET FOR NEW MON
      TH":CLOSE1
7000 INPUT "HIT 'ENTER'";O$:CLS:GOTO 900
7100 REM *****
7200 REM OPTION = ADD ENTRIES
7300 MD$="U":GOSUB 15800:GOSUB 18300
7400 CLS:PRINT:PRINT TAB(5);"ENTER AMOUNT 0, ACCOUNT 0
      TO QUIT"
7500 PRINT "LINE ";L1,"AMOUNT$";:INPUT A1:INPUT "ACCT N
      R";I%
7600 IF I%>0 THEN 7900
7700 PRINT "DATA ENTRY COMPLETED"
7800 INPUT "HIT 'ENTER'";O$:CLS:CLOSE1:GOTO 900
7900 IF I% = INT(I%) THEN 8000:PRINT "ERROR":GOTO 7500

8000 IF I%>0 AND I%<A1+1 THEN 8200
8100 PRINT "ACCOUNTS IN RANGE 1 - ";A1:GOTO 7500
8200 GOSUB 18500
8300 GET 1,PR%
8400 PRINT "ACCT# ";I%;" - ";TI$(SR%);"AMT $";:PRINT US
      ING "####.##";A1
8500 O$="":INPUT "HIT 'X' TO CANCEL, 'P' TO PROCESS";O$
8600 IF O$="X" THEN 7500 ELSE IF O$<>"P" THEN 8500
8700 S1=CVI(SI$(SR%)):C1=CVD(CT$(SR%)):Y1=CVD(YT$(SR%))
8800 A=A*S1:C1=C1+A:Y1=Y1+A
8900 LSET CT$(SR%)=MKD$(C1):LSET YT$(SR%)=MKD$(Y1)
9000 PUT 1,PR%
9100 L1=L1+1:GET1,1:LSET AC$(0)=MKI$(L1):PUT1,1
9200 GOTO 7500
9300 REM *****
9400 REM OPTION = PRINT SUMMARY
9500 MD$="U":GOSUB 15800:GOSUB 18300:I1=0:I2=0:E1=0:E2=
      0
9600 INPUT "MONTH AND YEAR FOR TITLE";T2$
9700 INPUT "PRINTER ON, PAPER IN, HIT 'ENTER'";O$:CLS
9800 LPRINT

9900 LPRINT TAB(11),"SUMMARY REPORT FOR ";F$;" ";T2$
10000 LPRINT "ACCOUNT NUMBER AND NAME";TAB(50);"CURRENT
      $";TAB(60);"YEAR TO DATE":LPRINT
10100 A$="#####.##"
10200 FOR I% = 1 TO A1
10300 GOSUB 18500
10400 S1=CVI(SI$(SR%)):C1=CVD(CT$(SR%)):Y1=CVD(YT$(SR
      %))
10500 IF S1=-1 THEN E1=E1+C1:E2=E2+Y1:GOTO 10700
10600 I1 = I1+C1:I2 = I2+Y1
10700 LPRINT I%;
10800 LPRINT TAB(5);TI$(SR%);
10900 LPRINT TAB(50);:LPRINT USING A$;ABS(C1),
11000 LPRINT USING A$;ABS(Y1)
11100 IF SR%=3 THEN GET 1
11200 NEXT I%
11300 LPRINT TAB(5);"GROSS INCOME";TAB(50);
11400 LPRINT USING A$;ABS(I1);:LPRINT USING A$;ABS(I2)
11500 LPRINT TAB(5);"TOTAL EXPENSES";TAB(50);
11600 LPRINT USING A$;ABS(E1);:LPRINT USING A$;ABS(E2)

```

pected format, with the expected number of lines and the expected headings, the contents are correct. The time you spend carefully verifying your test results at this stage may save you hours of agony later, when you have made modifications and believe that you have introduced the bug.

Decide before you start modifying exactly what functional and "cosmetic" modifications you are going to make. One of the universal truths I have discovered is that given a piece of code written by someone else, no matter how perfect, a programmer will find a way to "improve" it. It is sometimes helpful to ask yourself why you're making a particular modification.

A true functional improvement will enhance the usefulness or accuracy of a program. In the "Keepbook" conversion, I added a response that repeated the dollar amount and account number, and provided the account title to the user for verification before updating the account files on disk. This was important to me since the system maintained no audit trail of individual entries, and tracking back an entry inadvertently made to the wrong account could be difficult.

"Cosmetic" modifications, on the other hand, do not affect the program's functions at all. They either make the program easier to read or they make the displays clearer or more attractive. This does not mean that they are not worth doing. If the program you're starting from works fine, but is almost totally unintelligible, it's probably worth clearing up. How much of this you want to do depends a lot on what you plan to do with the final program.

If you want to pass it on, or publish your version, you'll probably do more cosmetic work than if it's strictly for your own use. Another factor is how much time you have. If you're working against some kind of a deadline, you probably will be satisfied with something that works but isn't so pretty. Among the cosmetic modifications I made to the Keepbook system was re-spacing and centering the dis-

play of the main menu of options. This was strictly for my own esthetic satisfaction.

Whatever changes you decide to make should be evaluated in advance. Ad hoc changes made as you happen to think of them will almost invariably cause more problems than they are worth. The main thing to remember about any modification is that every change you make requires that much more testing, and it's frequently those "little" changes that cause the most debugging headache.

Make a catalog of variables names and meanings. This applies whether you stick with the original ones or change them, and makes it easier to track down the effects of changes you have made or are thinking about. It will also speed your understanding of the program. If you plan to publish or otherwise distribute the program, you may want to include the variables catalog in the program remarks, for the benefit of future programmers who will be just as mystified as you were.

Keep the remarks current, or add them if there aren't any. This is something we all think about when writing our own programs, but it is often forgotten in converting programs. Nothing is more frustrating than to read through a complete and enlightening remarks section, only to find that it no longer bears any relationship to the code. The few extra minutes it takes to change the remarks to correspond to your changes in the code will be well worth your while. If nothing else, it may help you remember why you did what you did.

Give credit where credit is due. No matter how much you have modified the original program, or how terrible its condition may have been, you have used someone else's work. You certainly deserve the credit for your conversion effort and for any enhancements you have added, but the original author should not be ignored or forgotten. Retain the original credit in your program heading, and add yourself as the converter.

After reviewing my converted

program and my conversion "rules," I analyzed the scope and types of changes I made in the conversion process. I compared my converted program to the original version and identified all added or changed statements. I divided the added and changed statements into three categories: "technical changes," "functional changes" and "cosmetic changes."

The original program had 137 lines; my converted program had 194 lines. Nearly half of the added lines were remarks, mostly clarifying the disk I/O logic. Most of the other lines added were in the disk-handling area. Of the 137 original lines in the program, 112 were changed in the conversion. Over 80 percent of the changes were required "technical" changes. Of the total of 168 lines that were added or changed, only about 20 involved purely "cosmetic" changes.

The Conversion Process

Converting "Keepbook" from its North Star format to run on a TRS-80 was primarily a conversion of the disk-handling logic. The two systems handle disk files, at least random disk files, very differently, and the original author took advantage of some features of the North Star method, which made the TRSDOS conversion a little more difficult. Other changes were mostly for syntax.

General: I changed all INPUT and PRINT statements to remove the device number designation. PRINT statements I modified to use TAB and PRINT USING. I made required punctuation changes. Where appropriate, I inserted CLS, replacing the North Star logic. Variable names I retained in essentially the original form.

Lines 100-1800: I added remarks and changed the main menu format to center on the screen.

Lines 1900-4400: In line 2100 I added a header line to identify the "Construct New File" option. All the disk logic is new. I added variable MD\$ (line 2400) to communicate to the disk routines whether this was a creation of a

new file (MD\$="N") or use of a previously created file (MD\$="U"). See discussion of disk handling, below.

Lines 4500-5800: This I modified for new disk handling. I inserted the file name (F\$) in the completion message (line 5500) for clarification in the case where the user might have several different "Keepbook" files.

Lines 5900-7000: Same changes as the previous lines.

Lines 7100-9200: I added an "echo" back to the user (line 8400), giving the account number and dollar amount as entered, and supplying the account title from the account file on disk. In order to make this response fit nicely on one line, I reduced the length of the account title (T\$) from 40 to 35 characters. The user then has the option to process the entry or cancel it and try again (lines 8500-8600).

Lines 9300-12200: For clarity, I added the file name to the heading line of the summary report.

Lines 12300-13800: No changes in the Help section.

Lines 13900-14100: I added a CLOSE to the file here, mostly for use during testing, when runs were bombing out with the file still open and I wanted to close it properly before trying again. I left it in because it didn't hurt anything. TRSDOS doesn't mind if you close a file that's already closed.

Lines 14200-15600: The source sheet routine was one of the hardest for me to figure out. Looking at the example in the article (Fig. 1, p. 60) really helps. The form is made up of character strings consisting of the letter I and the underline character, CHR\$(95). I totally reworked this using the TRS Level II BASIC string manipulation instructions, but the result was the same as in the original.

Lines 15700-17900: This is the new disk logic. In TRSDOS a random file can be used for either input or output. If a file is designated as random (R) in an OPEN statement, and no file by that name exists, TRSDOS creates one. This can be irritating if you don't type well and

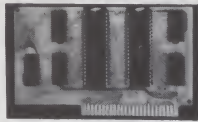
```

11700 LPRINT TAB(5);"NET INCOME";TAB(50);
11800 LPRINT USING A$;I1+E1,:LPRINT USING A$;I2+E2
11900 IF L1<=L0 THEN 12100
12000 LPRINT "CURRENT EXPENSES FROM LINE ITEMS ";L0;" T
O ";L1-1
12100 INPUT "PLEASE TURN OFF PRINTER AND HIT 'ENTER'";O
$
12200 CLS:CLOSE1:GOTO 900
12300 REM *****
12400 REM OPTION = HELP
12500 PRINT "KEEPBOOK IS A SIMPLE BOOKKEEPING SYSTEM"
12600 PRINT "BASED ON THE IDEA THAT YOU HAVE A LINE ITE
M"
12700 PRINT "EXPENSES AND INCOMES WHICH FIT INTO ACCOUN
T"
12800 PRINT "CATEGORIES. CURRENT PERIOD (MONTH) AND YE
AR-"
12900 PRINT "TO-DATE TOTALS ARE MAINTAINED. WHEN YOU CO
NSTRUCT"
13000 PRINT "A NEW FILE ALL ACCUMULATORS ARE SET TO ZER
O, AS"
13100 PRINT "THEY ARE WITH THE NEW-YEAR OPTION, WHEREAS
"
13200 PRINT "THE NEW-MONTH OPTION ONLY SETS THE CURRENT
"
13300 PRINT "ACCUMULATORS TO ZERO. TO ASSURE THAT YOU
ARE"
13400 PRINT "RECORDING ALL EXPENSES, THE SYSTEM COACHES
"
13500 PRINT "FOR LINE ITEMS, SO USE THE OPTION TO PRINT
"
13600 PRINT "DATA COLLECTION SHEETS AS NEEDED."
13700 INPUT "HIT 'ENTER' TO CONTINUE";O$:CLS
13800 GOTO 900
13900 REM *****
14000 REM OPTION = END
14100 CLS:PRINT:PRINT:PRINT "GOODBYE":CLOSE 1:END
14200 REM *****
14300 REM OPTION = PRINT SOURCE SHEET
14400 INPUT "LOWEST SEQUENCE NUMBER DESIRED";L0
14500 L0=INT(L0):IF L0>0 THEN 14700
14600 PRINT "LOWEST NUMBER ALLOWED IS ONE":GOTO 14400
14700 INPUT "PRINTER ON, PAPER IN, HIT 'ENTER'";O$
14800 LPRINT "ITEM AMOUNT ACCT DESCRIPTION
";
14900 LPRINT " DATE REMARKS"
15000 L9$=STRING$(30,95)
15100 L8$=LEFT$(L9$,1)+I"+MID$(L9$,1,8)+I"+MID$(L9$,1
,4)+I"+MID$(L9$,1,30)
15200 L8$=L8$+I"+MID$(L9$,1,6)+I"+MID$(L9$,1,10)
15300 FOR I=L0 TO L0+49
15400 I$=STR$(I):LPRINT USING "% %";I$,:LPRINT L8$
15500 NEXT I
15600 INPUT "TURN PRINTER OFF AND HIT 'ENTER'";O$:CLS:G
OTO 900
15700 REM *****
15800 REM OPEN FILE ETC
15900 INPUT "NAME OF YOUR DATA FILE";F$
16000 REM IF THIS IS A NEW FILE CREATE (MD$=N) ALLOW CR
EATION
16100 REM IF IT IS AN ACCESS TO A PREVIOUSLY CREATED FI
LE
16200 REM (MD$=U) THEN OPEN IT AS INPUT TO VERIFY IT
16300 REM EXISTS BEFORE ALLOWING ACCESS.
16400 IF MD$="N" THEN 16600
16500 ON ERROR GOTO 19000:OPEN "I",1,F$~CLOSE 1:ON ERRO
R GOTO 0
16600 OPEN "R",1,F$
16700 REM DEFINE FOUR SUBRECORDS IN EACH 255-BYTE PHYSI
CAL
16800 REM RECORD. EACH ACCOUNT SUBRECORD IS 62 BYTES LO
NG
16900 REM WITH SEVEN SPARE BYTES AT THE END. FIELD DEFI
NITIONS
17000 REM ARE: ACCOUNT NAME - TI$ - 35 BYTES
17100 REM ACCT NBR - AC$ - 2 BYTES
17200 REM + OR - ACCT - SI$ - 2 BYTES
17300 REM CURRENT TTL - CT$ - 8 BYTES
17400 REM YTD TTL - YT$ - 8 BYTES
17500 FOR SR%=0 TO 3
17600 FIELD 1,(SR%*62) AS START$,35 AS TI$(SR%),2 AS A
C$(SR%),2 AS SI$(SR%),8 AS CT$(SR%),8 AS YT$(SR%)
17700 NEXT SR%
17800 GET 1,1
17900 RETURN
18000 REM *****
18100 REM GET NBR OF ACCTS, LAST ENTRY #, 1ST ENTRY # F
ROM
18200 REM SUBRECORD 0 OF PHYSICAL RECORD 1
18300 AI=CVI(TI$(0)):LI=CVI(AC$(0)):L0=CVI(SI$(0))
18400 RETURN
18500 REM *****
18600 REM COMPUTE PHYSICAL RECD NBR (PR%) AND SUBRECORD
NBR(SR%)
18700 REM BASED ON THE INPUT ACCOUNT NUMBER - I$.
18800 PR%=INT(I$/4)+1:SR%=INT(I$-(PR%-1)*4))
18900 RETURN
19000 REM *****
19100 REM ERROR ROUTINE FOR DISK
19200 PRINT "UNABLE TO FIND FILE ";F$
19300 INPUT "HIT 'ENTER' TO RETURN TO MAIN MENU";O$
19400 CLEAR:CLS:GOTO 900

```


MICRO MISCELLANY

APPLE II PARALLEL INTERFACE



\$79.95

Interfaces printers, synthesizers keyboards, and JBE A-D-D-A Converter & Switches. This Interface has 4 I/O ports with handshaking logic, 2-6522 VIA's and a 74LS74 for timing. Inputs and outputs are TTL compatible.

79-295K Complete Kit \$69.95
79-295A Assembled \$79.95

SOLID STATE SWITCH



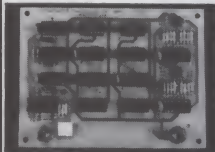
\$44.95

\$12.50

Your computer can control power (120VAC) to your printer, lights, and other 120VAC appliances up to 720 watts (6AMPS at 120VAC). Input 3 to 15 VDC, 2-13 MA TTL compatible, Isolation 1500V.

79-282 1 Channel Kit \$ 9.95
Assm. \$12.50
79-282 4 Channel Kit \$34.95
Assm. \$44.95

AtoD DtoA CONVERTER



\$69.95

Analog to Digital, Digital to Analog Converter, AtoD conversion time 20us. DtoA conversion 5us. Uses include speech and music synthesizing and slow scan TV. Single power supply (5V), 8 Bits wide, latched I/O, strobe lines.

79-287K Complete Kit \$49.95 ✓99
79-287A Assembled \$69.95

BARE BOARDS

SINGLE BOARD COMPUTERS

8088 5-CHIP SYSTEM \$29.95
8085 3-CHIP SYSTEM \$24.95

MEMORY BOARD

8208 64K DYNAMIC \$39.95

ALL PRODUCTS AVAILABLE FROM:

JOHN BELL ENGINEERING
P.O. Box 338
Dept. 8
Redwood City, CA 94064
(415) 367-1137

Add 6% sales tax in California and \$1.00 shipping and handling for orders less than \$20. Add 4% for VISA or M.C.

JOHN BELL ENGINEERING

are trying to update a file that is already there. You end up with empty files under all your misspelled file names.

I thought it would be a good idea to verify that the file existed on an update run (MD\$ = "U"). The only way I could figure to do it was to open the file as a sequential input file first. On an OPEN of a sequential input file, TRSDOS returns an error if the file isn't found. I routed this to a programmed error routine so you wouldn't lose control. You can simply go back to the main menu and try again. This is what's going on in lines 16400-16600. The rest of this routine defines the data format of the account records on disk using the FIELD statement. Each 255-byte disk record has four 62-byte account records in it.

The subrecords, 0 to 3, in each physical record are identified by the variable SR%. The first field is a "dummy" to space to the proper account subrecord. There are seven spare bytes at the end of each account subrec-

ord, and an additional seven spare bytes at the end of each physical record.

Lines 18000-18400: This subroutine moves the control information (number of accounts, current entry line number, starting entry line number for this month) from subrecord 0 of the first disk record. Since TRSDOS requires that disk data be in string format, the C-VI instruction is used to convert the data back to integers.

Lines 18500-18900: This routine computes which physical disk record and subrecord within it contain a given account number. It is basically a modulo divide-by-four, with the quotient the physical record number and the remainder the subrecord number.

Lines 19000-19400: Disk error routine.

Conversion of "foreign" programs can be frustrating and painful experience. But with a little planning and a few rules, it's almost painless, and can be a quick way to get a library of useful software. ■

APPLE II PLUS WITH 48K RAM	\$1190.
TEXAS INSTRUMENT 99/4 COMPUTER	\$ 989.
TI 810 PRINTER	\$1590.
TI 820 PRINTER	\$1890.
CENTRONIC PRINTERS:	
730-1 PARALLEL PRINTER	\$ 699.
737 PARALLEL INTERFACE	\$ 879.
SAVE ON ALL OTHER MODELS	
SPINWRITERS FROM NEC	
5510 R/O SERIAL INTERFACE	\$2499.
5520 KSR SERIAL WITH KEYBOARD	\$2790.
5530 PARALLEL INTERFACE	\$2499.
PAPER TIGER 440	\$ 929.
440C	\$ 990.
BASE-2 PRINTERS	
800 S.T.	\$ 559.
800 M.S.T.	\$ 599.
COMPRINT 912 APPLE, TRS-80, PET	\$ 559.
912 SERIAL	\$ 599.
KIM-1 W/MANUALS	\$ 155.
SYM-1 W/MANUALS	\$ 229.
COMMODORE BUSINESS MACHINES:	
CBM 8016 COMPUTER WITH LARGE SCREEN	\$1329.
8032	\$1505.
PET 2001-8K COMPUTER	\$ 695.
PET 2001-16K	\$ 895.
PET 2001-32K	\$1090.
PET 2022 TRAC. FEED PRINTER	\$ 699.
PET 2023 FRIC. FEED PRINTER	\$ 679.
PET 2040 DUAL FLOPPY DISK DRIVE	\$1090.
PET 8050 DUAL FLOPPY DISK DRIVE W/ONE MEG. STORAGE	\$1499.
ATARI 800	\$ 849.
400	\$ 495.
INTERTEC SUPERBRAIN (32K)	\$2595.
NORTH STAR COMPUTERS	
HRZ-2-32K-D-ASM	\$2275.
HRZ-2-32K-Q-ASM	\$2675.
DISPLAY TERMINALS:	
INTERTUBE II	\$ 775.
HAZELTINE 1410	\$ 775.
HAZELTINE 1420	\$ 949.
HAZELTINE 1500	\$ 999.
SAVE ON COMPLETE HAZELTINE LINE	

IMMEDIATE DELIVERY FROM STOCK PRICES SUBJECT TO CHANGE

MULTI-BUSINESS COMPUTER SYSTEMS

28 MARLBOROUGH STREET
PORTLAND, CONN. 06480 ✓81

M/F 9-6 SAT 9-3—(203) 342-2747—TWX-710-428-6345



GET THERE FIRST! MAKE THE ASIAN CONNECTION OCTOBER 8 ~ 22, 1980

- Visit Four International Electronics Shows in Korea, Japan, Taiwan & Hong Kong.
- Develop Top-Notch, Direct Contacts for Exciting, New Far East Electronics Products.
- \$2020.00 Covers Airfare, Hotels, Show Fees, Land Transportation, Most Meals...And More!

For details, contact:

JUDY EV

COMMERCE TOURS INTERNATIONAL, INC.* ✓317
870 Market Street, Suite 742-744
San Francisco, CA 94102
(415) 433-3072 or 433-3408

*The official travel agent for the Hong Kong Electronics Show & Japan Electronics Show.

Also, ask about spending 5 days more in Tokyo attending the 8th IFIP World Computer Congress.

How's your love life?

A little dull around the edges? Routine? Predictable? Boring? Maybe all it needs is a little Interlude. Interlude is the most stimulating computer game ever conceived. It combines a computer interview, an innovative programming concept, and a one-of-a-kind manual to turn your love life into exciting, adventurous, delicious fun!

Interlude is: romantic . . . playful . . . outrageous . . . a fantasy. Interlude is: ■ Wet fun on a hot summer night. (Interlude #21) ■ A surprise on the way home from dinner. (Interlude #42) ■ A bubble bath that ends with a bang. (Interlude #78) ■ An evening to rest while she does all the "work." (Interlude #25) ■ The most romantic of evenings. (Interlude #84) ■ A new twist to an old subject. (Interlude #69) ■ Just watching her. . . (Interlude #57) ■ An erotic fantasy! (Interlude #33)

With over 100 Interludes, you can satisfy all levels of interest and desire. Each Interlude is fully described in the manual, and the more elaborate ones are detailed with regard to settings, props, and mood-enhancing techniques. But we've saved a few super Interludes for that very special time when your interview indicates you're ready! At that time, you will be introduced to one of several Interludes held secret within the computer. (When you learn secret Interlude #99, your love life may never be the same again!) Interlude can give you experiences you'll never forget. Are you ready for it?

Interlude™
The Ultimate Experience.

Interlude, 10428 Westpark, Houston, Texas 77042 I'm really ready! Rush me _____ copies of Interlude today. ✓ 235

☐ For the Apple II (16K) # ☐ For the TRS-80 (Level II-16K) ## ☐ \$14.95 for cassette ☐ \$17.95 for diskette.
Add \$1.50 for shipping. Texas residents add 6% sales tax. My check (payable to Interlude) is enclosed. ☐

*Charge my ☐ MASTERCARD ☐ VISA account.

Account No. _____

Expiration date _____

All charge customers must sign.

Signature _____

Name _____

Age _____

Address _____

City _____

State _____

Zip _____

*CHARGE CUSTOMERS: Order by phone toll-free! **1-800-327-9009 Ext. 306**, Florida-1-800-432-7999

Apple II is a registered trademark of Apple Computers, Inc. ## TRS-80 is a registered trademark of Radio Shack, a Tandy Co.

Ext. 306

I remained still. The beat of the UART increased. I stated before that I was intermittent: So I am. And now, at this portion of the subroutine, the sense of that data pounding on my I/O port drove me almost to a RAM crash. The beating grew more intense, 'til I

thought the UART would burn out.

A new argument was loaded into the registers: what if the programmer sensed that something was wrong? The assembler's cycle had come! I JMPed into the final block and accessed the RAM.

It set a flag—one flag only. In an instant I pulled its address ENABLE low and left the latch set. But for many cycles the UART beat on. This, however, did not hex me. Finally, at last, it ceased. The program had stopped dead. Its STY would trouble me no more.

If you still diagnose me as malfunctioning, you won't think so after I describe what I did to conceal the program. First of all, I broke it up into 1K blocks.

I pulled up the lines on my EPROM board and laid it byte by byte onto the chips. I then reset the lines on the bus so cleverly, so cunningly, that no STY, not even *its* own, could have directly accessed it.

No program, not a trace of byte nor bit, was left in the RAM. I was too wary to risk leaving a byte lying in the RAM as evidence—I used a bit bucket to catch it all! CTRL G! CTRL G!

When I was finished, I addressed

the resident real-time clock. It was 04:00:00.00. At that time there was a BREQ on the bus, so I serviced it, still humming along to myself at 2 MHz, for what should I have to be RESET over? It was a diagnostic program for DMAing from the mini-floppy. A flag bit had been set during a run, the second daisy-chain device was SELECTed, and the diagnostic had been called up to check for bugs.

I granted the BREQ and invited the diagnostic to enter the RAM. The flag bit, I said, had been set by me in an I/O check. The assembler, said I, had gone to the cassette drive for the time being. I let the diagnostic search all 64K; I showed it every page.

We finally arrived at *its* board. Since the EPROM section of the board was only accessible after a remote byte had been properly masked, it was transparent. Instead, a call-up of the board accessed RAM. I told the diagnostic to feel free to reside in that RAM when it finished. I was so confident, if confidence is a trait which may be applied to a machine, that I set my PC on the very location where the assembler would have been.

The diagnostic finished with its check, thoroughly convinced that

nothing was wrong. I was running cool. The diagnostic remained to exchange data that the DMA processor had accumulated with me.

Something dreadfully wrong was happening, though I wasn't sure what. At first I had sensed that the problem was within my subroutine. The sense of it grew, until I realized that it was occurring outside of my program. The diagnostic showed no sign of even noticing the problem. Was it unaware of the pulse? No! It was waiting for me to make a check.

The horrible pulse persisted! It grew stronger with every mark and space. Soon it became unbearable, but the diagnostic continued as if nothing was wrong. It just continued with its stream of mindless data. The point drew near, the threshold was approaching, I could no longer bear it! I HALTed the diagnostic from its relentless transferral and strobed:

4C FF F8 JMP

"STOP! STOP! Cease, I say! I confess, I confess!"

6D DO 09:ADC
80 00 OC:STA

"There it is! Just stop the relentless beat of that UART!" ■



You may love Wayne Green . . . you may hate him . . . but you have to admit he has vision. And that vision created 80 Microcomputing—the only major publication devoted to today's largest selling computer.

80 Microcomputing is not just any computing magazine . . . it's a magazine written for the users of Tandy's TRS-80*, a magazine written to tell you the truth about it. Wayne Green has never been one to mince words and so 80 Microcomputing tells you the good things about the TRS-80* and the not so good. 80 Microcomputing also has reviews of compatible equipment, programs and applications, plus users reactions that let you know how the TRS-80* works and what it can do. Also you can save hundreds of dollars on equipment by buying what you know is right. And of course, 80 Microcomputing has the editorial fireworks from Wayne that the industry has come to expect.

So subscribe to 80 Microcomputing . . . the industry's only major publication for your computer . . . the TRS-80*.

Circle 60 on the Reader Service card for a subscription form . . . or call use at 800-258-5473.

*TRS-80 is a trademark of Tandy ✓ 60

TOLL FREE ORDERING



These Fine
Products and More

NORTHSTAR	ASM	KIT	TERMINAL		
HRZ-1-16K-D	1600.	1275.	SOROC IQ-120	760.	
HRZ-1-32K-D	1995.	1580.	HAZELTINE 1400	760.	
HRZ-2-32K-D	2300.	1900.	HAZELTINE 1500	940.	
HRZ-1-32K-Q	2300.	1750.	HAZELTINE 1510	1050.	
HRZ-2-32K-Q	2700.	2230.	TELEVIDEO 912	700.	
			TELEVIDEO 920	750.	
RAM-16K	365.	325.	PRINTERS		
RAM-32K	565.	515.			
FPB-A	285.	220.		BASE-2	450.
MDS-A-D	710.	660.		TI-810	1580.
MDS-A-Q	880.	830.	CENTRONICS-799	970.	
EXTRA DRIVE-D	—	350.	NEC-5510	2550.	
EXTRA DRIVE-Q	—	525.	NEC-5520	2800.	
HARD DISC SYSTEM	CALL		SOFTWARE—DISCS—MISC		
Most NorthStar computers come standard with real wood cover, 2 serial ports, 1 parallel port, real time clock, disc operating system and NorthStar basic.			AUTOSCRIBE	325.	
			VERBATUM DISCS (10)	28.	
			5 FOOT RS-232 CABLE	20.	
			10 FOOT RS-232 CABLE	25.	

WE WILL TRY TO BEAT ANY ADVERTISED PRICE

A. E. I. ✓ 96

4341 W. Commonwealth Ave Suite D
Fullerton, Calif. 92633
(714) 739-4701 (800) 854-6003

New Releases For The TRS-80*

FOR THE ARMCHAIR PILOT

Introducing two NEW software packages for those who yearn to fly. These four simulations can take you from instrument landings to night-time photo-recon missions, you can be a bush pilot or an air traffic controller. We're Instant Software—Fly us!

Designed
for use on
TRS-80*
16K
LEVEL II

Night Flight



May, 1941—The dreaded Nazi battleship, the Bismarck, has broken out of the North Sea and is now somewhere in the North Atlantic. Your mission is to make a nighttime photo reconnaissance flight over the Bismarck. These photos will help the Admiralty determine the extent of damage done to the Bismarck in a previous battle and whether the British fleet has a chance to sink the German pocket battleship.

The Night Flight program lets you take-off, fly, and land a propeller driven aircraft. You can practice approaches

and landings with a full on-screen display of the landing field. Or, you can go on a mission, follow the radar vectors to your target, and get your photo (hopefully returning safely to your air-base without being shot down).

This program simulates the flight characteristics of a real aircraft with pilot input for all flight maneuvers. During the flight, you are supplied with a real-time stream of flight information, navigational aids, glide-slope markers, and landing field information. The instructions with this program can practically teach you to fly.

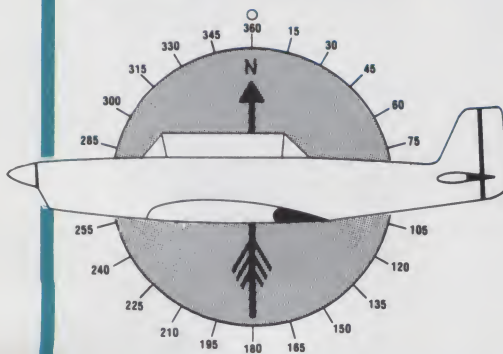
Somewhere out on the cold, gray North Atlantic, the Bismarck tries to elude her pursuers. Your photos are vital. Launch yourself into the night sky with the Night Flight package.

Order No.0117R. \$9.95

Designed
for use on
TRS-80*
16K
LEVEL II

Flight Path

- Mountain Pilot • O'Hare
- Precision Approach Radar



The Flight Path package will let you experience all facets of modern day aviation.

Mountain Pilot transforms you into a daring bush pilot as you fly badly needed supplies to a remote gold mining camp. You'll have to cross a hazardous mountain range, while struggling with headwinds, tricky navigation and rapidly diminishing fuel.

Watch your airspeed, altitude and rate-of-climb or you could stall-out and crash. If you deliver your supplies, you can't relax; you must return over those mountains with a heavy cargo of gold bullion.

O'Hare is a control tower simulation where you become an Air Traffic Con-

troller. The lives of hundreds of people become your responsibility as you guide aircraft through your control sector to a safe landing.

You'll have to deal with different aircraft requirements, wind change warnings and potential midair collisions. But no matter what happens, you must bring in twenty aircraft safely on your tour of duty.

Precision Approach Radar combines the skills of pilot and Air Traffic Controller. You become the pilots' eyes as they try to land in limited visibility conditions. Your commands guide the aircraft on their approach to the field—and a safe landing.

The Flight Path package covers both sides of flight procedure, from the thrill of flying to the tense drama of air traffic control.

Order No.0171R. \$9.95.

TO ORDER: Look for these programs at the dealer nearest you. If your store does not stock Instant Software send your order with payment to: Instant Software Inc., Order Dept., Peterborough, N.H. 03458 (Add \$1.00 for handling) or call toll-free 1-800-258-5473 (VISA, Master Charge and American Express accepted).

For a free catalog listing over 200 programs write: Instant Software Catalog Dept., Peterborough, N.H. 03458.

*A trademark of Tandy Corporation

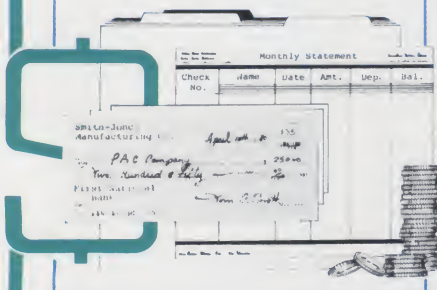
Instant Software™

Prices subject to change without notice.
PETERBOROUGH, N.H. 03458
603-924-7296

New Releases For The TRS-80*

FOR THE PRUDENT BUSINESSPERSON

Check Management System



CHECK MANAGEMENT SYSTEM

The Check Management System was created to provide you, the small business owner or individual, with a system for writing checks and maintaining records.

This program allows you to make check entries, edit or correct the entries, print the checks, and search and display check records by check number, code, date, description, or amount.

You'll be able to maintain a complete record of all your checks on disk for fast, easy access. You can record all your checks as you write them, have them automatically printed on fan-folded, pin/tractor feed check forms, and locate any specific check within one minute.

The program will do all the arithmetic for you, maintain a constant running balance, and, if you make a mistake,

allow you to correct your records without having to go through all the checks.

A Code command and Search routine allows you to print a list of all checks written for specific expenses. This is a great aid when tax time comes around.

The program can print check reports with your name or your business's name and account number at the top of each report.

This package requires the following minimum system:

1. A TRS-80 with 16K of memory.
2. An Expansion Interface with 16K of memory.
3. Two minidisk drives.
4. Any compatible Disk Operating System.
5. A pin/tractor-feed line printer.

Order No. 0147RD (disk-based version) \$39.95.

THE ONE-D MAILING LIST

Here is a one-disk mailing list system, with fast storage and retrieval for names and addresses. You have up to 17 categories of selection. Disk versatility allows you to add, delete, or change the numerous details stored in the system.

MAILING LIST FEATURES

- Automatically sorts names (alphabetically and by ZIP code).
- Rapid access to any name on file.
- Easy error correction and recovery.
- Prints selective name listings.
- Revise or up-date listings at any time.
- Up to 2500 names on-line (with 4 drives).

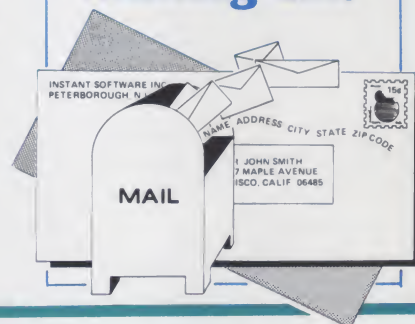
- Up to 17 mailing list categories.
- Prints a list of all names on file.
- Prints mailing labels.

The ONE-D MAILING LIST package is designed to be used with the following minimum system:

1. A TRS-80 Level II Microcomputer with 16K memory
2. An Expansion Interface with up to 32K RAM
3. A single disk-drive (with option for up to three additional disk-drives for extra storage space)
4. A line printer
5. Any compatible DOS for the TRS-80

Order No. 0123RD \$24.95

The One-D Mailing List



FOR THE INTELLECTUAL CHALLENGE

MIND WARP

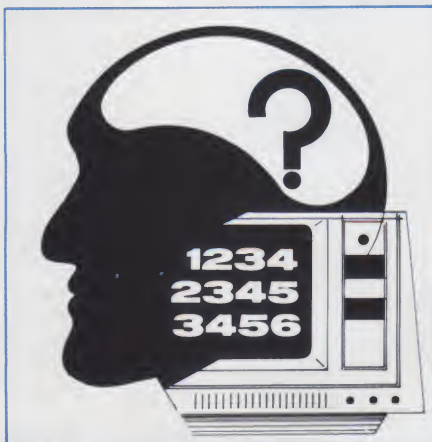
Are you a problem solver? Do you enjoy narrowing down possibilities until you've reached a solution? Then the Mind Warp package is what you've been lusting for!

This two-part package includes:

• **Mind Twist**—A mastermind-type game but with a "twist." Try to guess the computer's secret digit sequence. The computer will score your guesses.

• **Mind Bender**—A multi-level game where you must ferret out the computer's secret code. You have a choice of deciphering a three, four, or five digit code.

It's no enigma, the Mind Warp package is for puzzle lovers everywhere. For the TRS-80 Level II 16K. Order No. 0118R \$9.95.



I Q TEST

Ever wonder what your I Q is? Well here is the chance to find out, in the privacy of your own home, and have fun doing it. With the I Q Test program, your TRS-80 will administer and score an intelligence test in a mere 30 minutes.

For variety, there are three equivalent tests, each consisting of 35 questions. These questions are designed to test your knowledge and problem solving abilities.

There are not too many of us who can justifiably claim to be a genius, but here is a chance for you to find out! For the TRS-80 Level II 16K. Order No. 0157R \$9.95.

*A trademark of Tandy Corporation

Prices subject to change without notice

Instant Software™

PETERBOROUGH, N.H. 03458
603-924-7296

New Releases For The PET**

CHIMERA

If you think the legendary Chimera was hard to handle, wait until you try the Chimera package. Included are:

● **Reflex**—Round and round the little white ball rolls. Only fast reflexes can guide it into the center of the maze.

● **Dragon**—You'll have to shoot down those pesky, fire-breathing dragons with your cannon. If you succeed your castle will be safe, if not it will mean a call to your fire insurance company. For one player.

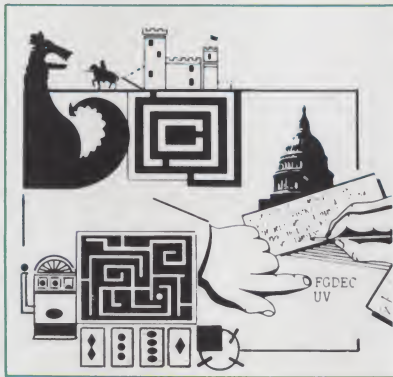
● **Dungeon**—A very punctual guard comes down to the dungeon every day to torture you. This means that you have only thirty seconds to dig your way under the castle to freedom. For one player.

● **Dragon Hunt**—You must go forth and slay a fire-breathing dragon. The only thing that will protect you from the flames is your shield, if you know when to use it. For one player.

● **Dropoff**—You must make your opponent's men "dropoff" the board by moving and firing your own men. For one or two players.

● **Batter-up**—You and another player take turns at bat as your PET becomes both the pitcher and the umpire.

You'll almost be able to feel the Chimera's fiery breath as you play the games on your 8K PET. Order No. 0110P \$9.95.



HOOPTEODOODLE

This package is a collection of eight entertaining programs for you and your 8K PET. You'll escape from a monster in an unseen maze, try your luck with the one-armed bandits, cross a treacherous mine field, deflect the "bouncing ball",

direct a low level bombing mission, maneuver a high-speed "worm" to score points, launch ground to air missiles, and play a challenging card game.

Having fun with this package is as easy as pressing PLAY on the Recorder. Order No. 0091P \$9.95.

CODE NAME: CIPHER

Enjoy that feeling of intrigue and discovery with the Code Name: Cipher package. Included are:

● **Memory Game**—Would you like to match your memory against the computer's? You can with the Memory Game.

● **Codemaster**—One player types in a word, phrase, or sentence, and the PET translates that message into a cryptogram. The other player must break the code and solve the cryptogram in the shortest time possible.

● **Deceitful Mindmaster**—This isn't your ordinary Mastermind-type game. You must guess the five letters in the hidden code word.

● **Code Breaker**—Cracking this code won't be as easy as cracking walnuts. You'll need to flex your mental muscles to win this game.

If you want a mental challenge, then Code Name: Cipher is for you. For the 8K PET. Order No. 0112P. \$7.95.

OTHER PROGRAMS AVAILABLE FROM INSTANT SOFTWARE:

TRS-80* LEVEL I & II

0001R	Basic and Intermediate Lunar Lander.....	\$7.95
0002R	Space Trek II.....	\$7.95
0004R	Beginner's Backgammon/Keno.....	\$7.95
0007R	Ham Package I.....	\$7.95
0008R	Electronics I.....	\$7.95
0009R	Golf/Cross-Out.....	\$7.95
0017R	Air Flight Simulation.....	\$7.95
0019R	Business Package IV.....	\$9.95
0023R	Oil Tycoon.....	\$7.95
0033R	Bowling.....	\$7.95
0043R	Santa Paravia and Fiumaccio.....	\$7.95
0046R	Othello.....	\$9.95
0050R	Grade Book.....	\$7.95
0057R	Chessmate-80.....	\$19.95
0099R	Typing Teacher.....	\$7.95

TRS-80* LEVEL II

0028R	Ramrom Patrol/Tie Fighter/Klingon Capture.....	\$7.95
0034R	Space Trek IV.....	\$7.95
0047R	Who-Dun-It?.....	\$7.95
0049R	Demo II.....	\$7.95
0051R	Ball Turret Gunner.....	\$9.95
0055R	Demo III.....	\$7.95
0056R	Bowling League Statistics System.....	\$24.95
0058R	Programmer's Converter.....	\$9.95
0063R	Cards.....	\$7.95
0065R	Teacher.....	\$9.95
0066R	Mimic.....	\$7.95
0068R	Your Cribbage and Checkers Partner.....	\$9.95
0069R	Household Accountant.....	\$7.95
0070R	Skirmish-80.....	\$9.95
0072R	Financial Assistant.....	\$7.95
0076R	Utility I.....	\$7.95
0081R	Utility II.....	\$7.95
0082R	Daredevil.....	\$9.95
0084R	Music Master.....	\$7.95
0089R	Energy Audit.....	\$49.95
0092R	Archimede's Apprentice.....	\$9.95
0100R	Video Speed-Reading Trainer.....	\$7.95
0103R	Personal Bill Paying.....	\$7.95
0106R	Airmail Pilot.....	\$7.95
0111R	Wordwatch.....	\$7.95
0117R	Night Flight.....	\$9.95
0125R	Investor's Paradise.....	\$9.95
0127R	Surveyor's Apprentice.....	\$9.95
0132R	Energy Consumption.....	\$9.95
0135R	Executive Expense Report Generator.....	\$9.95
0136R	Beginner's Russian.....	\$9.95
0137R	Everyday Russian.....	\$9.95
0156R	Money Madness.....	\$9.95
0171R	Flight Path.....	\$9.95
0250R	IRV.....	\$24.95

TRS-80* DISKS

0052RD	Energy Audit.....	\$75.00
0075RD	Accounts Receivable/Payable.....	\$199.95
0123RD	The One-D Mailing List.....	\$24.95
0139RD	Disk-Scope.....	\$19.95
0147RD	Check Management System.....	\$39.95
0180RD	Disk Editor.....	\$39.95
0212RD	The Russian Disk.....	\$24.95

PET**

0005P	Personal Weight Control/Biorhythms.....	\$7.95
0006P	Mortgage w/Prepayment Option/Financier.....	\$7.95
0014P	Casino I.....	\$7.95
0015P	Casino II.....	\$7.95
0026P	Dow Jones.....	\$7.95
0029P	Tangle/Supertrap.....	\$7.95
0032P	Trek-X.....	\$7.95
0035P	PET Demo I.....	\$7.95
0038P	Qubic-4/Go-Moku.....	\$7.95
0039P	Mimic.....	\$7.95
0044P	Penny Arcade.....	\$7.95
0045P	Arcade II.....	\$7.95
0048P	Accounting Assistant.....	\$7.95
0054P	Ham Package I.....	\$7.95
0062P	Baseball Manager.....	\$14.95
0064P	Dungeon of Death.....	\$7.95
0074P	Arcade I.....	\$7.95
0083P	Digital Clock.....	\$7.95
0085P	Electronics Engineer's Assistant.....	\$9.95
0091P	Hooptedoodle.....	\$9.95
0097P	Turf and Target.....	\$7.95
0104P	Decorator's Assistant.....	\$7.95
0105P	PET Utility I.....	\$9.95
0110P	Chimera.....	\$9.95
0112P	Code Name: Cipher.....	\$7.95
0175P	Santa Paravia and Fiumaccio.....	\$9.95

APPLE***

0018A	Golf.....	\$7.95
0025A	Mimic.....	\$7.95
0040A	Bowling/Triology.....	\$7.95
0073A	Math Tutor I.....	\$7.95
0079A	Oil Tycoon.....	\$9.95
0080A	Sahara Warriors.....	\$7.95
0088A	Accounting Assistant.....	\$7.95
0094A	Mortgage w/Prepayment Option/Financier.....	\$7.95
0096A	Space Wars.....	\$7.95
0098A	Math Tutor II.....	\$7.95
0148A	Air Flight Simulation.....	\$9.95
0174A	Santa Paravia and Fiumaccio.....	\$9.95
0087H	Mental Gymnastics.....	\$7.95

HEATH***

PROGRAMS IN GERMAN:

The programs listed here can be purchased through:
MicroShop Bodensee
Markstrasse 3,
7778 Markdorf, West Germany

TRS-80*

6004R	Beginner's Backgammon/Keno
6007R	Ham Package I
6008R	Electronics I
6009R	Golf/Cross-Out
6017R	Air Flight Simulation
6028R	RamRom Patrol
6031R	Space Trek III
6034R	Space Trek IV
6043R	Santa Paravia and Fiumaccio
6065R	Teacher
6069R	Household Accountant
6072R	Financial Assistant
6076R	Utility II
6081R	Utility I

PET**

6026P	Dow Jones
6032P	Trek X
6044P	Penny Arcade
6045P	Arcade II
6074P	Arcade I
6083P	Digital Clock

PROGRAMS IN ITALIAN:

The programs listed here can be purchased through:
HOMIC s.r.l.
Piazza De Angeli 1,
20146 Milano, Italy

TRS-80*

9043R	Acquaviva e Montefalcone
9065R	Professore
9107R	Guerre Stellari
9108R	Volo Aereo/Space Trek

* A trademark of Tandy Corporation

** A trademark of Commodore Business Machines, Inc.

*** A trademark of Apple Computer Co.

**** A trademark of Heath Co.

Instant Software™

Prices subject to change without notice.

PETERBOROUGH, N.H. 03458
603-924-7296

Ask for Instant Software at a computer store near you.

Alabama

Anderson Computers
3156 University Dr., Huntsville
Computerland of Huntsville
3020 University Dr., Huntsville
Olensky Bros.
3763 Airport Blvd., Mobile

Arizona

Professional Data Systems
4506 A.N. 16th St., Phoenix
Milletts TV & Radio
621 East Broadway, Mesa

California

AMCO Elect. Supply
635 E. Arrow Hwy., Azusa
Byte Shop
8038 Clairmont Mesa Blvd., San Diego
Byte Shop
123 E. Yorba Linda, Placentia
Byte Shop of Mt. View
1415 West El Camino Real, Mt. View
Byte Shop of Sacramento
6041 Greenback Ln., Citrus Heights
Byte Shop of San Francisco
1032 Irving St., San Francisco
Capital Computer Systems
3396 El Camino Ave., Sacramento
Computers Made Easy
819 East Ave. Q.9, Palmdale
Computer Store of San Leandro
701 MacArthur Blvd., San Leandro
Computer World
6791 Westminster Ave., Westminster
Computerland
16720 S. Hawthorne, Lawndale
Computerland of W. LA
6840 La Cienega Blvd., Inglewood
Coast Electronics
3118 No. Main St., Morro Bay
Computerland
24001 via Fabricante No 904, Mission Viejo
Hobbi-ronics
1378 So. Bascom Ave., San Jose
Hobby World
19511 Business Ctr. Dr., Unit 6, Borthridge
Huntington Computing
2020 Charles St., Corcoran
I.C.E. House Inc.
398 North E. St., San Bernardino
Jade Computer Products
4901 W. Rosecrans, Hawthorne
Malibu Microcomputing
23910A Deville Way, Malibu
Martam Co.
6351 Almaden Rd., San Jose
Opamp/Technical Books
1033 N. Sycamore Ave., Los Angeles
PC Computers
10166 San Pablo Ave., El Cerrito
Q.I. Computers, Inc.
15818 Hawthorne Blvd., Lawndale
Radio Shack Dealer
8250 Mira Mesa Blvd., San Diego
Radio Shack Dealer
50 N. Cabrillo Hwy., Half Moon Bay
Santa Rosa Computer Center
604 7th St., Santa Rosa
Silver Spur Elect. Comm.
13552 Central Ave., Chino
The Computer Store
820 Broadway, Santa Monica

Colorado

Byte Shop
3464 S. Acoma St., Englewood
Colorado Computer Systems
311 W. 74th Ave., Westminster
Computerland of North Denver
8749 Wadsworth Blvd., Arvada
Computer Shack
1635 South Prairie, Pueblo
The Computer Store
2300 Welton St., Denver

Connecticut

American Business Computers
454 Thames St., Groton
Computerlab
130 Jefferson, New London
Computerland
1700 Post Rd., Fairfield
Computerland
60 Skiff St., Hamden
Computer Works
1439 Post Rd. E., Liberty Plaza, Westport

D.C.

The Program Store
4200 Wisconsin Ave., N.W., Washington, D.C.

Florida

Al Personal Computer
178 Oxford Rd., Fern Park
AMF Electronics
11146 N. 30th St., Tampa
Boyd-Ebert Corporation
1328 West 15th St., Panama City
Computer Center
6578 Central Ave., St. Petersburg
Computer Junction
5450 So. State Rd. 7, Ft. Lauderdale
Computerland
7374 S. Tamiami Trail, Sarasota
Computerland of Ft. Lauderdale
3963 N. Federal Hwy., Ft. Lauderdale
Computerland of Jacksonville
2777-6 University Blvd. W, Jacksonville
Computerland of Tampa
1520 E. Fowler Ave., Tampa
Computerland of West Palm Beach
4275 Okeechobee Blvd., West Palm Beach
Computer Shack
3336 Beach Blvd., Jacksonville
Computer System Resources Inc.
3222 S.W. 35th Blvd., Gainesville
Curtis Waters Enterprises
236 Talbot Ave., Melbourne
Heath Kit Electronic
4705 W. 16th Ave., Hialeah
HIS Computerization
1295 Cypress Ave., Melbourne
Ukatan Computer Store
Airport Rd., Destin
Williams Radio & TV Inc.
2062 Liberty St., Jacksonville
Your Basic Computer Store
971 Seaway Dr., Ft. Pierce

Georgia

Atlanta Computer Mart
Atlanta
Computerland of Atlanta
2423 Cobb Parkway, Smyrna

Hawaii

Computerland of Hawaii
567 N. Federal Hwy., Honolulu
Radio Shack Assoc. Store
1712 S. King St., Honolulu

Idaho

Electronic Specialists
8411 Fairview Ave., Boise

Illinois

Computerland
4507 North Sterling, Peoria
Computerland
9511 N. Milwaukee Ave., Niles
Computer Station
3659 Nameoki Rd., Granite City
Garcia & Associates
203 No. Wabash Ave., Suite 1510, Chicago
Midwest Micro Computers, Inc.
708 S. Main St., Lombard

Indiana

Computer Center of South Bend
51591 US 31 North, South Bend
Data Domain
221 W. Dodds, Bloomington
Fall Creek Electronics Store
732 Center St., Pendleton

Iowa

Memory Bank
4128 Brady St., Davenport

Kansas

Central Kansas Computers
6 S. Broadway, Herington

Louisiana

Computer Shoppe Inc.
3225 Danny Pk., Metairie

Maine

Main Computronics
Intown Plaza, Bangor
Radio Shack
315 Main Mall Rd., So. Portland

Maryland

Jack Fives Electronics
4608 Deblen Circle, Pikesville
The Comm Center
9624 Ft. Meade Rd., Laurel

Massachusetts

ComputerCity
175 Main St., Charlestown
ComputerCity
50 Worcester Rd., Framingham
Computerland of Boston
214 Worcester Rd., Wellesley
Computer Packages Unlimited
244 W. Boylston St., West Boylston
Lighthouse Computer Software
14 Fall River Ave., Rehoboth

Mark Gordon Computers
15 Kenwood St., Cambridge
New England Electronics Co
679 Highland Ave., Needham
Small Business System Group
Main St., Dunstable
The Computer Store
120 Cambridge St., Burlington
Tutts Radio & Electronics
206 Mystic Ave., Medford

Michigan

Computer Center
28251 Ford Rd., Garden City
Computer Connections
38437 Grand River, Farmington Hills
Computerland of Grand Rapids
2927 28th St. S.E., Kentwood
Computerland of Southfield
29673 Northwestern Hwy., Southfield
Computer Mart
560 W. 14 Mile Rd., Clawson
Computer Room
455 E. Michigan Ave., Kalamazoo
Computronix Corp
423 S. Saginaw Rd., Midland
Hobby House
1035 W. Territorial Rd., Battle Creek
Main Systems Inc.
1161 No. Ballenger Hwy., Flint
The Alternate Source
1806 Ada, Lansing
The Eight Bit Corner
722 Evanston Ave., Muskegon
Ye Olde Teacher Shoppe
1823 Witmyre St., Ypsilanti

Minnesota

Computerland of Hopkins
11319 Hwy. F., Hopkins
Digital Den
Burnsville Center
Minnesota Software Inc.
5422 Fisher St., White Bear Lake
Zim Computers
5717 Xerxes Ave., N. Brooklyn Center

Mississippi

Dyer's, Inc.
200 E. Main St., West Point
Softwarehouse
816 Foley St., Jackson
W. Vernon Foster Inc.
816 Foley St., Jackson

Missouri

Century Next Computers
1001 E. Walnut, Columbia
Comp-U-Trs Software Center
51 Florissant Oaks Shopping Center, Florissant
Software Shack
16501 Greenwood Court, Belton

Montana

Intermountain Computer
529 So. 9th St., Livingston
Personal Computer
121 Red Oak Dr., Carl Junction
The Computer Store
1216 16th St. W., #35, Billings

Nebraska

Computerland of Omaha
11031 Elm St., Omaha
Midwest Computer Co. Inc.
8625 1st, Omaha
Midwest Computer Co. Inc.
4442 S. 84th St., Omaha
Midwest Computer Co. Inc.
4403 S. 87th St., Omaha
Scottsbluff Typewriters Inc.
1824 Broadway, Scottsbluff

Nevada

Century 23
4566 Spring Mountain Rd., Las Vegas
New Hampshire
Bitsnbytes Computer Center
568 Pleasant St., Concord
ComputerCity
1525 S. Willow, Manchester
Paul's TV
Main St., Fremont
Portsmouth Computer Center
31 Raynes Ave., Portsmouth
Radio Shack Assoc. Store
Fairbanks Plaza, Keene

New Jersey

Computer Corner of NJ
439 Rte. #23, Pompton Plains
Computer Encounter
2 Nassau St., Princeton
Computerland
35 Plaza Rte. #4, W. Paramus
Computer Mart of NJ
501 Rte. 27, Iselin
Crowley's
Rd. #3, Whitehouse Station
Dave's Electronics
Pennsville Shopping Ctr., Pennsville
GHB Enterprises Inc.
Rte. 38, Rutherford Ave., Mapleshade
Lashen Electronics Inc.
21 Broadway, Denville

New Mexico

Autel Electronics Co
232 Wisconsin N.E., Albuquerque
South West Computer Center
121 Wyatt Drive, Suite 7, Las Cruces
Thomas E. Carr Jeweler
1300A Tenth St., Alamogordo

New York

Aristo Craft
314 Fifth Ave., NYC
Bits & Bytes
2800 Straight Rd., Fredonia
Computer Corner
200 Hamilton Ave., White Plains
Computer Era Corp
1570 3rd Ave., New York
Computer Factory
485 Lexington Ave., NYC
Computer House, Inc.
721 Atlantic Ave., Rochester
Computerland of Nassau
79 Westbury Ave., Carle Place
Computerland of New York City
58 W. 44th St., New York
Computer World
519 Boston Post Rd., Port Chester
Comtek Electronics, Inc.
2666 Coney Island Ave., Brooklyn
Comtek Electronics, Inc.
Staten Island Mall
Store 220A, Staten Island
Digibyte Systems Corp
31E 31st St., New York
80 Microcomputer Services
118 Masten Ave., Cohoes
Home Computer Center
671 Monroe Ave., Rochester
Mr. Computer
Imp. Plaza, Rte. 9, Wappingers Falls
Soltron Systems
308 Columbia Turnpike, Rensselaer
The Computer Tree Inc.
409 Hooper Rd., Endwell
Upstate Computer Shop
629 French Rd., Campus Plaza
New Hartford
North Carolina
Byte Shop of Raleigh
1213 Hillsborough St., Raleigh
Stocum Shopping Ctr., Havelock
Ohio
Altair Business Systems, Inc.
5252 North Dixie Dr., Dayton
Astro Video Electronics
504 E. Main St., Lancaster
Cincinnati Computer Store
4816 Interstate Dr., Cincinnati
Computerland
4579 Great Northern Blvd., N. Olmstead
Computerland
6429 Busch Blvd., Columbus
Computerland
1288 Som Rd., Mayfield Heights
Computer Store of Toledo
18 Hillwyck Dr., Toledo
Forbes Microsystems Inc.
35 N. Broad, Fairborn
Microcomputer Center
7900 Paragon Rd., Dayton
Micro-Mini Computer World
74 Robinwood, Columbus
21st Century Shop
16 Convention Way, Cincinnati
Universal Amateur Radio, Inc.
1280 Aida Dr., Columbus

Oklahoma

Sounds, Etc.
Hwy. 33, Watonga
Vern Street Products
Radio Shack Dealer
114 W. Taft St., Sapulpa
Oregon
Computerland of Portland
12020 S.W. Main St., Tigard
Computer Pathways Unlimited, Inc.
2151 Davco St. S.E., Salem
TRS 80 Products Ltd.
3520 S.E. Vineyard Rd., Portland
Pennsylvania
Artco Elect.
302 Wyoming Ave., Kingston
Artco Elect.
Back Mountain Shop Ctr.
Shavertown
Audio Mart
518 Fifth Ave., New Brighton
Computer Workshope
3848 William Penn Hwy., Monroeville

Computerland of Harrisburg
4644 Carlisle Pike, Mechanicsburg
Computerland of Pittsburgh
5499 William Flynn Hwy., Gibsonia
Erie Computer Co.
2127 West 8th St., Erie
Mighty Byte Computer Center
537 Easton Rd., Horsham
Personal Computer Corp.
2426 West Lancaster Ave., Paoli
Personal Computer Corp.
Frazer Mall, Lancaster Ave., Frazer

Rhode Island

Computer City
165 Angell St., Providence
Digital World, Inc.
329 Bald Hill Rd., Warwick

South Dakota

CB Radio Shack
21st and Broadway, Yankton

Tennessee

ACS
1100 8th Ave. So., Nashville
Computerlab
671 S. Menden Hall Rd., Memphis
H & H Electronics Inc.
509 N. Jackson St., Tullahoma

Texas

Computer Port
2142 N. Collins, Arlington
Houston Computer Tech
5313 Bissonnet, Bellare
Interactive Computer
7620 Dashwood, Houston
K.A. Elect.
9090 Stemmons Frwy., Dallas
Pan American Elect. Inc.
1117 Conway, Mission
Radio Shack Dealer
21969 Katy Freeway, Katy
The Compute Shop
6353 Camp Bowie Blvd., Ft. Worth
Waghalter Books Inc.
3 Greenway Plaza E., Houston

Utah

DC Computer Co.
1911 West 70 South, Provo
Quality Technology
470 E. 2nd So., Salt Lake City

Virginia

Computer Works
Rte. 6, Box 65A, Harrisonburg
Home Computer Center
2927 Virginia Beach Blvd., Virginia Beach
Southside Radio Comm
135 Pickwick Ave., Colonial Heights

Washington

American Mercantile Co. Inc.
2418 1st Ave. S., Seattle
Byte Shop of Bellevue
14701 N.E. 20th St., Bellevue
Computer Connection Inc.
3100 NW Bucklin Hill Rd., Silverdale
Computerland of South King Co.
1500 S. 336 St., Suite 12
Federal Way
Personal Computers
5104 Freya, Spokane
Ye Old Computer Shop
1301 G. Washington, Richland

West Virginia

The Computer Corner Inc.
22 Beechurst Ave., Morgantown
The Computer Store
Municipal Parking Bldg., Charleston

Wisconsin

Byte Shop of Milwaukee
6019 West Layton Ave., Greenfield
Computerland
690 S. Whitney Way, Madison
Computer World
3015 W. Wisconsin Ave., Appleton
Pettiford Microsystems
4265 W. Loomis Rd., Milwaukee

Wyoming

Computer Concepts
1104 Logan Ave., Cheyenne

Puerto Rico

The Microcomputer Store
1566 Ave. Jesus T. Pinerio
Caparra Terrace

Canada

CANADIAN DISTRIBUTORS
Micron Distributing
409 Queen St. W., Toronto, Ont.
M5V 2A5
Computerland of Winnipeg
715 Portage Ave., Winnipeg, Man.
Compumart
411 Roosevelt Ave., Ottawa, Ontario
Micromatic Systems Inc.
101 8136 Park Rd., Richmond, B.C.
Micro Shack of W. Canada
333 Park Street, Regina, Sask.
Orthon Holdings Ltd.
12411 Stony Plain Road
Edmonton, Alberta
Total Computer Systems
Ajax, Ontario

Instant Software™

PETERBOROUGH, N.H. 03458
603-924-7296

Q & A on Printers and Terminals

Part 3 in a series.

David Price
3901 Victoria Lane
Midlothian, VA 23113

Compared to the high-powered technology that goes into the rest of a microcomputer, input/output devices aren't that interesting. Although terminals and printers may be among the more mundane aspects of a microcomputer, they are also among the more necessary and, in some cases, the most costly. On the other hand, declining prices make it possible for the careful shopper to find good bargains in top-flight equipment. First, however, you have to know what you're looking for.

Video terminals

Q: Having both a video terminal and a printer seems redundant. Why not use a combined keyboard-printer (such as a Teletype) and forget the video display?

A: Some people do it that way. In fact, the Teletype model 33 is one of the best selling terminals ever.

Video terminals, however, have many advantages over printing terminals of comparable price. First, video terminals are silent. Second, they do not consume paper

or ribbon. Third, they are faster. Fourth, the better ones can do razzle-dazzle special effects that a printer can't do.

Q: What sort of special effects?

A: The most common is *cursor control*. A cursor is a special character—typically a small rectangle—that shows where the *next* character of text is displayed. As a new character appears on the screen, the cursor automatically advances to the next position. Cursor control allows the programmer to make the cursor move elsewhere. If the cursor was in the middle of line 15, for example, the computer might issue a command instructing the video terminal to relocate the cursor to the beginning of line 12. All ensuing transmissions would be displayed starting at line 12 instead of the old location.

Several effects can make an important word or message stand out on the screen. A word displayed in *reverse video* consists of black characters against a white background, instead of the usual white-on-black. *Blinking* characters, as the name suggests, are those that the host computer has specified to blink on and off. *Half intensity* displays some characters brighter than others.

Q: How many characters of text can a video display hold at one time?

A: That depends on the page format of the terminal. Two common formats are 64 X 16 (64 characters by 16 lines) and 80 X 24. Terminals that use low-bandwidth monitors or home TV sets are often restricted to formats of lower density, such as 32 X 16. At the other extreme, some monitors, such as the Motorola M4408, can handle 132 characters on 48 rows with no sacrifice in clarity.

Q: How are characters formed on the screen?

A: The usual method is to form characters on a *dot matrix*, which is a rectangular grid of a predetermined size, such as 5 X 7 or 7 X 9. Placing dots on all the points of the imaginary grid yields a solid rectangle. By selectively printing dots only on certain points, the terminal can create dot configurations that resemble printed characters such as letters, numbers, and punctuation.

The more points on the grid, the better some characters will look. A 7 X 9 dot matrix, therefore, is preferable to a 5 X 7 matrix. Terminals using smaller matrices are also limited in other respects. They often cannot produce lowercase letters, for

Photo 1. Two dot-matrix printers. The printer in the foreground is KSR (keyboard send receive); the one in the background is RO (receive only). (Courtesy Centronics Corp.)

Photo 2. A friction-feed printer. Paper is controlled with platen friction instead of a pin tractor. (Courtesy Centronics Corp.)



example. Some of them try to generate lowercase, but the letters are hard to read because the 5 X 7 matrix allows no room for descenders, such as the tail of a *p* or a *g*.

Many printers use dot matrix too. In fact, one recently introduced printer has an $n \times 9$ matrix—that is, it allows variable spacing between characters.

Q: Can video terminals draw pictures?

A: Some can. It can be a very useful feature, too. Integrated “appliance” computers like the TRS-80 and the Apple almost always have provisions for screen graphics.

From the programmer’s viewpoint, the screen of a graphics terminal is a great big dot matrix. Instead of having dimensions of 5 X 7 or 7 X 9, though, they might be 280 X 192 (Apple II Hi-Res) or 128 X 128 (CompuColor II). To plot graphs on the screen, the computer specifies the coordinates of the screen locations desired.

A few terminals can display graphics in color. An early product of this type for microcomputers was the TV Dazzler, which used a 64 X 64 grid. At each point of the grid, you could select between half and full intensity and specify any combination of the three primary colors.

Q: Is it possible to create graphics without making the program calculate every point?

A: A couple of shortcuts let a user “draw” the points himself. The first is a *digitizer*, an auxiliary device that allows a user to trace over existing drawings. A digitizer consists of a working surface (the *tablet*), a moveable crosshairs viewer and controlling electronics. You could lay a map on the tablet and trace over the desired route with the viewer. The unit would sense the position of the viewer as it moved about the map and transmit the resulting coordinates to the computer.

The second device is a *light pen*. With a light pen, you can point to a location on the terminal display screen. The terminal determines the coordinates of that location. Some of the new single-chip video display controllers, such as the Intel 8275, have provisions for light-pen input.

Printers

Q: Why does output from a printer look so peculiar?

A: You are referring to a specific type of printer that uses dot-matrix characters. Just as with a video terminal, dot matrix characters from a printer look odd.

Q: How does the printer put the dots on paper?

A: Several methods are used.

One is direct impact, where a column of wires move across the paper, punching the dots through a fabric ink ribbon. Impact printing has the advantage of being able to handle multipart carbon forms; the force of the wires can affect carbon paper the same



Photo 3. A quartet of band printers. (Courtesy Centronics Corp.)

way an ordinary typewriter does.

A second method is thermal printing. This approach also uses moving wires; instead of striking a ribbon, however, they use heat to form impressions on special heat-sensitive paper.

A third method is inkjet printing. Inkjet uses no print wires. Instead, a column of ink ejectors squirts tiny droplets of ink on the paper. Unlike thermal printing, impact and inkjet can use ordinary, untreated paper.

Q: What other types of printers are there besides these dot-matrix designs?

A: Most of the others form whole characters at a time, as a typewriter does.

Cylinder printers (e.g., Teletype 33) and band printers provide dump-grade output, while daisy-wheel and type-ball printers provide letter-grade output. The type cylinder of a cylinder printer has raised characters positioned around its circumference. The characters are in regular rows and columns; when a character is called for, the cylinder moves vertically to the desired row and spins to the desired column. A hammer behind the cylinder then hits the cylinder

Photo 4. A video terminal with detached keyboard. (Courtesy Soroc Technology)





Photo 5. A speech-recognition subsystem for microcomputers. (Courtesy Heuristics, Inc.)

against the ink ribbon, leaving an image of that character on the paper. Band printers are similar, except they use type bands, which are continuous loops with raised characters at regular intervals on the outside of the loop.

Daisy wheels and their new variant, the print thimble, provide output comparable to a good office typewriter's. Type-ball printers—the popular Selectric mechanism is an example—also provide high-quality output. The printheads of these units are usually designed for easy removal, so the user can select from printheads containing different character styles.

Q: What about those big-technology laser printers? What about those page printers that spit out a zillion lines a minute? What about...

A: Forget them. At least for now, they're bigger than the checkbook of even the most dedicated, self-indulging hobbyist.

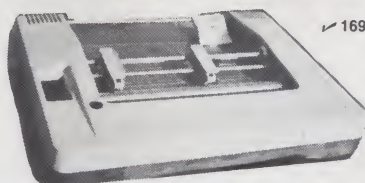
Q: Well, how much do they cost?

A: It's like this: if you have to ask, you can't afford one. ■



Photo 6. A daisy wheel. These are used as the type elements in many letter-quality printers. (Courtesy Qume Corp.)

PRINTER MECHANISM

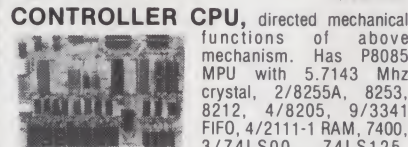


Made by Binder Magnete for U.S. assembled 180 CPS bidirectional matrix printer, 0-132 and 0-158 columns. Includes single platen, ribbon drive, paper guides, motors, belts, etc. In 26"Wx8 1/2"Hx20"D beige case with cast aluminum bottom. Add your own control/interface electronics and print heads and make it operational. 75 lbs. sh. #MPM/M12 **\$125.**

PRINT STAND for above, chocolate brown steel with 24"x13" top support. Space behind foot panel for storage. O/A 24"Wx25 1/2"Hx21"D; 38 lbs. Shipped via truck or bus. #PSD/M12 **\$25.**

DATANETICS KEYBOARD

75 keys, ASCII encoded, +5 and -12 VDC required. Keyboard assembled with unassembled case. PCB cable, pinouts. 20x7 1/4"x2 3/4", 10 lbs. sh. #0284-819-10 **\$89.95**



CONTROLLER CPU, directed mechanical functions of above mechanism. Has P8085 MPU with 5.7143 Mhz crystal, 2/8255A, 8253, 8212, 4/8205, 9/3341 FIFO, 4/2111-1 RAM, 7400, 3/74LS00, 74LS125, 74LS161. Sockets for 6/2708's. Requires +12, -12, +5, & -5 VDC. #217-244 **\$100.**

Send for our **FREE New SURPLUS CATALOG Today!**
Address Dept. K • VISA, MASTERCARD Accepted.
Prices F.O.B. Lima, O. • Orders over 50 lbs. fgt. coll.
Electronic Surplus Since 1947 Phone 419/227-6573

FAIR RADIO SALES

1016 E. EUREKA • Box 1105 • LIMA, OHIO • 45802

APPLE PRODUCTS

Apple II Plus 16K	\$995.00
Apple II Plus 32K installed	1095.00
Apple II Plus 48K installed	1195.00
Non Apple Memory 16K tested	(59.95*) 69.95
Apple Disk II w/controller	529.00
Apple Disk II w/o controller	479.00
Apple Pascal Language System	(399.00*) 429.00
Apple Clock/Calendar	249.00

INTERFACE CARDS AND ACCESSORIES

Apple Integer Rom card	179.00
Apple H.S. Serial Interface	169.00
Apple Centronics Parallel int	189.00
SSM Serial/Parallel int	175.00
CCS Serial Interface	159.00
CCS Parallel Interface	119.00
D.C. Hayes Micromodem II	349.00
M & R Super-Term 80 col board	349.00
M & R Super-mod II modulator	29.00

PRINTERS AND MONITORS

Apple Silenttype w/interface	(549.00*) 595.00
Trendcom 200 w/graphics	595.00
Anadex 8000-AP Cider	895.00
IDS Paper Tiger w/graphics	995.00
Qume Sprint 5 55/RO	(2895.00*) 3195.00
Leedex Video 100 12 in 8 & W	149.00
Leedex Video 200 12 in 8 & W	199.00

DISKETTES - 10 PER BOX - 5 1/4 INCH

Tru-data in plastic box	(29.95*) 34.95
Verbatim	34.95
Memorex	34.95
Scotch	39.95
Apple	44.95

SOFTWARE

Applewriter text editor	69.00
Apple Cashier Inventory Sys	219.00
Apple Controller Gen. Ledg. AP. AR	519.00
BPI General Ledger Sys	300.00
BPI Accounts Recv. Sys	300.00
High-Tech Data Base Sys	89.00
High-Tech Client Billing Sys	249.00

(*Special price good thru end of magazine cover date)

OLENSKY BROS., INC. ✓ 130

COMPUTER SYSTEMS DIVISION

3763 Airport Blvd. • Mobile, AL 36608

(205) 344-7448

We Ship Fast!



Industrial quality components for S-100 system builders, from California Computer Systems

2422 Disk Controller. Single and double density controller for up to four 5 1/4" or 8" single-sided drives, or two double-sided drives. Shipped with CP/M 2.0, the controller reads and writes IBM-standard single density. Automatically determines disk density — single or double. Supports PerSci auto eject, plus fast-peek for voice coil systems.

2810 Z80 CPU Board. Capable CPU for S-100 Systems operates at 2 or 4MHz, is fully Altair/Imai compatible. Z-80 monitor is available separately. Includes auto addressing to 4K boundaries, plus a serial port for serial devices, including terminals and printers. Supports both front-panel operation and power-on memory jump, plus wait-state generation for slower memories. Compatible with proposed IEEE S-100 standards.

2032A 32K Static RAM. Fast static memory operates without wait states at a full 4MHz. Supports full and partial bank select, for expansion beyond 64K. Addressable in 8K blocks at 8K boundaries. Address and data lines are fully buffered, and there are no DMA restrictions.

2016 16K Static RAM. Fully buffered board features 2114 static RAMs for +5v operation. Bank select available by bank port or bank byte, for system expansion beyond 64K. Addressable in 4K blocks at 4K boundaries. LED indicators for board selection and bank selection. Available in 200, 300, or 450 nsec versions. All versions support 4MHz operation with no wait states.

2200A Mainframe. Rock solid, heavy gauge cabinet includes 12-slot, actively terminated S-100 motherboard, fan, and power supply. Power supply features 105, 115, or 125 volt AC input power; provides +8vDC at 20 amps ± 16v DC at 4 amps. Available in five colors. Includes convenient, front mounted, lighted reset switch.

2501A Mother Board. 12 slots, actively terminated, with all S-100 connectors included. Distributed power line bypass, low inductance interconnect — extremely low bus noise.

Prototype Boards. Four high quality prototype boards: Solder Tail, Extender/Terminator, Wire Wrap, and Etch.

P2802AA 6502 CPU. Stand-alone CPU generates fully S-100 compatible I/O signals; executes 6502 machine language. Operates at 2MHz; capable of DMA operation.

Available nationally.

California Computer Systems industrial quality S-100 products are available at over 250 computer retailers. Volume customers should contact the marketing department at CCS.

CCS. Industrial standards

We see the S-100 a little differently.



We mass-produce S-100 products to deliver industrial quality, at industrial prices.

You systems builders who need top quality, full featured, *workhorse* S-100 building blocks at the most competitive prices now have a source. California Computer Systems.

Industrial quality means top grade materials, components, and assembly, plus complete testing for absolute reliability.

Industrial quality means solid designs, a full complement of the important features you require, and a product line that delivers performance.

Industrial pricing comes from mass production. We buy at the right prices, and build *in quantity*, using state-of-the-art facilities and techniques. Including complete burn-in, for full performance right off the shelf.

Our industrial point of view means you get higher performance, greater reliability, and lower prices. If these are features you would like to see in your S-100 system, see things our way.

Because for serious users with serious uses for the S-100, these are the industrial standards.

✓ 148



California Computer Systems

250 Caribbean Sunnyvale, CA 94086 (408) 734-5811

Integer Choice Game for Compucolor

The computer is sometimes easy to beat, but don't be deceived.

David B. Suits
Rochester Institute of Technology
Rochester, NY 14623

This game program does not rely on an elaborate (or even a simple) statistical analysis of the player's past moves. In deciding its moves, the computer knows nothing—and cares nothing—of the player's moves. Consequently, the computer will sometimes be easy to beat—if you understand the program.

But for players who have not analyzed the program, the game can be a source of frustration. From the player's point of view, it often seems as though the computer is engaged in a remarkably deceptive strategy of second-guessing the player's moves, and the computer can end up the winner by a significant margin.

For references to discussions of the strategy this program makes use of, see Martin Gardner's column in the April 1975 issue of *Scientific American*.

Lines 430, 500 and 860 merely slow down the output so that data doesn't flash by too quickly on the display. You can omit these lines for hard-copy output or slower displays.

I wrote this program in Compucolor Disk BASIC 8001 V6.78 on my Compucolor II; the program requires less than 3K bytes. Compucolor Disk BASIC allows variable names of any length (but looks at only the first two characters). I have taken advantage of this feature by using names that are descriptive of their functions. The program should be easy to translate into any Microsoft BASIC with only minor changes. Specifically, the PLOT statements are color commands, so omit them if you are working in black and white. ■

Program listing. Integer Choice Game program in Compucolor Disk BASIC.

```
10 PLOT 6,6,12,14
20 PRINT TAB( 20 )"THE INTEGER CHOICE GAME"
30 PLOT 15
40 PRINT
50 REM      FROM MARTIN GARDNER'S
60 REM      'MATHEMATICAL GAMES',
70 REM      SCIENTIFIC AMERICAN, MARCH & APRIL, 1975
80 REM
90 REM      WRITTEN IN COMPUCOLOR DISK BASIC 8001 V6.78
100 REM     BY D.B.SUITS
110 REM     OCTOBER,11 A.L.
120 REM
130 PLOT 18:PRINT "THINK OF A POSITIVE INTEGER."
140 PRINT "I'LL THINK OF ONE, TOO."
150 PRINT "(OR THREE, OR FOUR....  HA! HA!)"
160 PRINT
170 PRINT "THEN WE'LL COMPARE OUR NUMBERS."
180 PRINT
190 PRINT "WHOEVER HAS PICKED THE SMALLER NUMBER WINS A POINT,"
200 PRINT "UNLESS IT IS SMALLER BY ONLY 1, IN WHICH CASE THE"
210 PRINT "OTHER GUY GETS 2 POINTS."
220 PRINT
230 PRINT "FOR EXAMPLE, IF YOUR NUMBER IS 15 AND MINE IS 20,"
240 PRINT "THEN YOU WIN A POINT."
250 PRINT "BUT IF YOU PICK 15 AND I PICK 16, THEN I WIN 2 "
260 PRINT "POINTS--YOU GET NONE."
270 PRINT
280 PRINT "SIMPLE, ISN'T IT?"
290 PRINT
300 PRINT
310 USER= 0:REM      USER'S SCORE
320 ME= 0:REM      MY SCORE
330 TIME= 0:REM      EVERY 5 PLAYS THE SCORE WILL BE PRINTED
340 REM
350 REM      **** GET THE NUMBERS ****
360 REM
370 MYNUM= 1:REM      MY NUMBER
380 RANNUM= RND ( 1 )
390 IF RANNUM> .0625THEN MYNUM= 2
400 IF RANNUM> 0.375THEN MYNUM= 3
410 IF RANNUM> 0.625THEN MYNUM= 4
420 IF RANNUM> 0.9375THEN MYNUM= 5
430 FOR J= 1 TO 500:NEXT J:REM      SLOW DOWN A BIT
440 PRINT :PLOT 22
450 PRINT "I HAVE MY NUMBER."
460 PRINT "WHAT IS YOUR NUMBER? ";:PLOT 17:INPUT "":PLAYERNUM
470 IF PLAYERNUM> 0AND PLAYERNUM= INT (PLAYERNUM)THEN 520
480 PLOT 21:PRINT "    OH, A WISE GUY, EH?"
490 PRINT "    OR CAN'T YOU READ INSTRUCTIONS?"
500 PRINT "    POSITIVE INTEGERS ONLY, PLEASE."
510 GOTO 440
520 PLOT 18:PRINT TAB( 7 )"MY NUMBER IS:"::PLOT 17:PRINT MYNUM
530 PRINT
```


Sample run.

```
LOAD"INTEGE":RUN
      THE INTEGER CHOICE GAME

THINK OF A POSITIVE INTEGER.
I'LL THINK OF ONE, TOO.
(OR THREE, OR FOUR.... HA! HA!)

THEN WE'LL COMPARE OUR NUMBERS.

WHOEVER HAS PICKED THE SMALLER NUMBER WINS A POINT,
UNLESS IT IS SMALLER BY ONLY 1, IN WHICH CASE THE
OTHER GUY GETS 2 POINTS.

FOR EXAMPLE, IF YOUR NUMBER IS 15 AND MINE IS 20,
THEN YOU WIN A POINT.
BUT IF YOU PICK 15 AND I PICK 16, THEN I WIN 2
POINTS--YOU GET NONE.

SIMPLE, ISN'T IT?
```

```
540 REM      **** FIND THE WINNER ****
550 REM
560 FOR J= 1TO 500:NEXT J:REM  SLOW DOWN
570 PLOT 19
580 IF MYNUM- PLAYERNUM= 0THEN 770
590 IF MYNUM- PLAYERNUM< - 1THEN 740
600 IF MYNUM- PLAYERNUM= - 1THEN 710
610 IF MYNUM- PLAYERNUM> 1THEN 680
620 REM
630 REM      **** PRINT RESULTS ****
640 REM
650 PRINT "GOTCHA!  2 POINTS FOR ME."
660 ME= ME+ 2
670 GOTO 800
680 PRINT "1 POINT FOR YOU."
690 USER= USER+ 1
700 GOTO 800
710 PRINT "YOU WIN 2 POINTS ON THAT ONE."
720 USER= USER+ 2
730 GOTO 800
740 PRINT "1 POINT FOR ME."
750 ME= ME+ 1
760 GOTO 800
770 PRINT "TIE!  WE'LL HAVE TO TRY AGAIN."
780 PRINT
790 GOTO 350
800 TIME= TIME+ 1
810 IF TIME< 5THEN 350
820 REM
830 REM      **** GIVE SCORE ****
840 REM
850 PRINT
860 FOR J= 1TO 500:NEXT J:REM  SLOW DOWN
870 PLOT 23:PRINT "THE SCORE IS NOW:"
880 PLOT 21:PRINT "-----"
890 PLOT 23:PRINT "ME:"ME;TAB( 10 )"YOU:"USER
900 PLOT 21:PRINT "-----"
910 PRINT
920 TIME= 0
930 PLOT 17:INPUT "DO YOU WISH TO CONTINUE? ";ANSWER$
940 IF LEFT$(ANSWER$,1)= "Y"THEN 350
950 PLOT 19:PRINT
960 IF ME> USERTHEN 1020
970 IF ME< USERTHEN 1000
980 PRINT "SORRY TO SEE YOU QUIT WHEN WE'RE TIED."
990 GOTO 1040
1000 PRINT "QUITTING WHILE YOU'RE AHEAD, I SEE!  SMART!"
1010 GOTO 1040
1020 PRINT "I DON'T BLAME YOU."
1030 PRINT "BETTER LUCK NEXT TIME."
1040 PRINT
1050 PRINT
1060 END
READY
```

```
I HAVE MY NUMBER.
WHAT IS YOUR NUMBER? 1
MY NUMBER IS: 3

1 POINT FOR YOU.

I HAVE MY NUMBER.
WHAT IS YOUR NUMBER? 3
MY NUMBER IS: 1

1 POINT FOR ME.

I HAVE MY NUMBER.
WHAT IS YOUR NUMBER? 4
MY NUMBER IS: 3

YOU WIN 2 POINTS ON THAT ONE.

I HAVE MY NUMBER.
WHAT IS YOUR NUMBER? 5
MY NUMBER IS: 3

1 POINT FOR ME.

I HAVE MY NUMBER.
WHAT IS YOUR NUMBER? 1
MY NUMBER IS: 4

1 POINT FOR YOU.

THE SCORE IS NOW:
-----
ME: 2      YOU: 4
-----

DO YOU WISH TO CONTINUE? Y

I HAVE MY NUMBER.
WHAT IS YOUR NUMBER? 2
MY NUMBER IS: 2

TIE!  WE'LL HAVE TO TRY AGAIN.

•
•
•

I HAVE MY NUMBER.
WHAT IS YOUR NUMBER? 2
MY NUMBER IS: 4

1 POINT FOR YOU.

I HAVE MY NUMBER.
WHAT IS YOUR NUMBER? 3
MY NUMBER IS: 3

TIE!  WE'LL HAVE TO TRY AGAIN.

I HAVE MY NUMBER.
WHAT IS YOUR NUMBER? 2
MY NUMBER IS: 3

GOTCHA!  2 POINTS FOR ME.

I HAVE MY NUMBER.
WHAT IS YOUR NUMBER? 4
MY NUMBER IS: 2

1 POINT FOR ME.

THE SCORE IS NOW:
-----
ME: 7      YOU: 6
-----

DO YOU WISH TO CONTINUE? N

I DON'T BLAME YOU.
BETTER LUCK NEXT TIME.
```


Lifeboat

Software for most popular 8080/280* computer disk systems including
NORTH STAR, iCOM, MICROPOLIS, DYNABYTE DB8/2 & DB8/4, EXIDY SORCERER, SD SYSTEMS, ALTAIR, VECTOR MZ, MECA, 8" IBM, HEATH H17 & H89, HELIOS, IMSAI VDP42 & 44, REX, NYLAC, INTERTEC SUPER-BRAIN, VISTA V80 and V200, TRS-80* MODEL I and MODEL II, ALTO, OSCIENTIFIC, DIGI-LOG, KONTRON PSI-80, IMS 5000 diskette formats and CSSN BACKUP cartridge tapes.

CP/M* VERSION 2 FOR TRS-80 MODEL II NOW AVAILABLE

Genuine CP/M for Apple II coming soon!
Call for details.

All Lifeboat programs require CP/M, unless otherwise stated.

	Software with Manual	Manual Alone
CP/M* FLOPPY DISK OPERATING SYSTEM — Digital Research's operating system configured for many popular micro-computers and disk systems:		
System	Version	Price
North Star Single Density	1.4	145/25 v
North Star Double Density	1.4	145/25
North Star Double Quad	2.x	170/25
Durango F-85	2.x	170/25
iCOM Micro-Disk 2411	1.4	145/25
iCOM 3212	1.4	170/25 v
iCOM 3812	1.4	170/25
Mits 3202/Altair 8800	1.4	145/25
Heath H8 & H17	1.4	145/25 m
Heath H89	1.4	145/25 m
Heath H89 by Magnolia	1.4	250/25
Heath H89 by Magnolia	2.x	300/25
Onyx C8001	2.x	300/25
TRS-80 Model I	1.4	145/25 m
TRS-80 Model II	1.4	170/25
TRS-80 Model II + Corvus	2.x	250/25
Processor Technology Helios II	1.4	145/25
Cromemco System	1.4	145/25
Intel MDS Single Density	1.4	145/25
Intel MDS Single Density	2.x	170/25
Micropolis Mod I	1.4	145/25 v
Micropolis Mod II	1.4	145/25 v

The following configurations are scheduled for release soon:

Apple II SoftCard	2.x	350/25
North Star Double Quad + Corvus	2.x	250/25
North Star Horizon HD-1	2.x	250/25
Ohio Scientific C3	2.x	200/25
Ohio Scientific C3-C	2.x	250/25
Micropolis Mod II	2.x	200/25
Mostek MDX STD Bus System	2.x	350/25**
iCOM 3812	2.x	225/25
iCOM 4511/Perfec D3000	2.x	375/25**

Software consists of the operating system, text editor, assembler, debugger and other utilities for file management and system maintenance. Complete set of Digital Research's documentation and additional implementation notes included. Systems marked * and ** include firmware on 2708 and 2716. Systems marked * include \$440 media charge. Systems marked ** require the special versions of software in this catalog. Systems marked v have minor variants available to suit console interface of system. Call or write for full list of options. * Includes hardware addition to allow our standard versions of software to run under it.

DIGITAL RESEARCH

- MP/M** — Installed for single density MDS-800. Multi-processing derivative of the CP/M operating system. Manual includes CP/M2 documentation. **\$300/\$50**
- MAC-8080** — Macro assembler. Full Intel macro definitions. Pseudo Ops include RPC, IRP, REPT, TITLE, PAGE, and MACLIB. Produces absolute hex output plus symbol table file for use by SID and ZSID (see below). **\$120/\$15**
- SD-8080** — Symbolic debugger. Full trace, pass count and breakpoint program testing. Has backtrace and histogram utilities. When used with MAC, provides full symbolic display of memory labels and equated values. **\$105/\$15**
- ZSID-8080** — Symbolic debugger with all features of SID. **\$130/\$15**
- TEX** — Text output formatter to create paginated, page-numbered and justified copy. Output can be directed to printer, disk. **\$105/\$15**
- DESPPOOL** — Utility program to permit simultaneous printing from text files while executing other programs. **\$80/\$10**

Z80 DEVELOPMENT PACKAGE

- Consists of: (1) disk file editor, with global inter and intra-line facilities; (2) Z80 relocating assembler, Zilog/Mostek mnemonics, conditional assembly and code reference table capabilities; (3) linking loader producing absolute Intel hex disk file. **\$95/\$20**
- ZDT** — Z80 Monitor Debugger to break and examine registers with standard Zilog/Mostek mnemonic disassembly displays. \$35 when ordered with Z80 Development Package. **\$50/\$10**

AVOCET SYSTEMS

- XASM-68** — Non-macro cross-assembler with nested conditionals and full range of pseudo operations. Assembles from standard Motorola MC68000 mnemonics to Intel hex. **\$200/\$25**
- XASM-65** — As XASM-68 for MOS Technology MCS-6500 series mnemonics. **\$200/\$25**
- XASM-68** — As XASM-68 for Intel MCS-68 and UPL-41 families. **\$200/\$25**
- XASM-18** — As XASM-68 for RCA 1802. **\$200/\$25**

- DISTEL** — Disk based disassembler to Intel 8080 or TDX/XTan 800 source code, listing and cross reference files. Intel or TDX/XTan pseudo ops optional. Runs on 8080. **\$65/\$10**

- DISLOG** — As DISTEL to Zilog/Mostek mnemonic disassembly. **\$65/\$10**

- SMAL/80** Structured Macro Assembler Language — A package of powerful general purpose text macro processor and SMAL structured language compiler. SMAL is an assembler language with IF-THEN-ELSE, LOOP-REPEAT-WHILE, DO-END, BEGIN-END constructs. **\$75/\$15**

- tiny C** — Interactive interpretive system for teaching structured programming techniques. Manual includes full source listings. **\$105/\$50**
- BDS C COMPILER** — Supports most features of language, including Structures, Arrays, Pointers, recursive function evaluation, overlays, includes linking loader, library manager, and library containing general purpose, file I/O, and floating point functions. Lacks initializers, statics, floats and longs. Documentation includes "The C PROGRAMMING LANGUAGE" by Kernighan and Ritchie. **\$145/\$25**
- WHITESMITHS C COMPILER** — The ultimate in systems software tools. Produces faster code than a pseudo-code Pascal with more extensive facilities. Conforms to the full UNIX* Version 7 C language, described by Kernighan and Ritchie, and makes available over 75 functions for performing I/O, string manipulation and storage allocation. Linkable to Microsoft REL files. Requires 60K CP/M. **\$650/\$30**

MICROSORT

- BASIC-80** — Disk Extended BASIC, ANSI compatible with long variable names, WHILE/WEND, chaining, variable length file records. **\$325/\$25**
- BASIC COMPILER** — Language compatible with BASIC-80 and 3-10 times faster execution. Produces standard Microsoft relocatable binary output. Includes MACRO-80. Also linkable to FORTRAN-80 or COBOL-80 code modules. **\$350/\$25**
- FORTRAN-80** — ANSI 66 (except for COMPLEX) plus many extensions. Includes relocatable object compiler, linking loader, library with manager. Also includes MACRO-80 (see below). **\$425/\$25**
- COBOL-80** — Level 1 ANSI '74 standard COBOL plus most of Level 2. Full sequential, relative, and indexed file support with variable file names. STRING, UNSTRING, COMPUTE, VARYING/UNTIL, EXTEND, CALL, COPY, SEARCH, 3-dimensional arrays, compound and abbreviated conditions, nested IF. Powerful interactive screen-handling extensions. Includes compatible assembler, linking loader, and relocatable library manager as described under MACRO-80. **\$700/\$25**
- MACRO-80** — 8080/280 Macro Assembler. Intel and Zilog mnemonics supported. Relocatable linkable output. Loader, Library Manager and Cross Reference List utilities included. **\$149/\$15**
- XMARCO-86** — 8086 cross assembler. All Macro and utility features of MACRO-80 package. Mnemonics slightly modified from Intel ASM86. Compatibility data sheet available. **\$275/\$25**
- EDIT-80** — Very fast random access text editor for text or with many features. Global and in-line commands supported. File compare utility included. **\$89/\$15**

- PASCAL/M*** — Compiles enhanced Standard Pascal to compressed efficient Code. Totally CP/M compatible. Random access files. Both 16 and 32-bit integers. Runtime error recovery. Convenient STRINGS. OTHERWISE clause on CASE. Comprehensive manual (90 pp. indexed). SEMIHEX provides for structured INPUT, OUTPUT and untyped files for arbitrary I/O. Requires 56K CP/M. Specify 1) 8080 CP/M, 2) 280 CP/M, or 3) Cromemco CDOS. **\$175/\$20**

- PASCAL/Z** — Z80 native code PASCAL compiler. Produces optimized, ROMable re-entrant code. All interfacing to CP/M is through the support library. The package includes compiler, relocating assembler and linker, and source for all library modules. Variables, strings and direct I/O are supported. Requires 56K CP/M. **\$395/\$25**

- PASCAL/MT** — Subset of standard PASCAL. Generates ROMable 8080 machine code. Symbolic debugger included. Supports interrupt procedures. CP/M file I/O and assembly languages. Both 16 and 32-bit integers can be BCD, software floating point, or ARM 9511 hardware floating point. Includes strings enumerations and record data types. Manual explains BASIC to PASCAL conversion. Requires 32K. **\$250/\$30**

- ALGOL-60** — Powerful block-structured language compiler featuring economical run-time dynamic allocation of memory. Very compact (24K total RAM) system implementing almost all Algol 60 report features plus many powerful extensions including string handling direct disk address I/O etc. **\$199/\$20**

- CBASIC-2** Disk Extended BASIC — Non-interactive BASIC with pseudo-code compiler and run-time interpreter. Supports full file control, chaining, integer and extended precision variables, etc. **\$120/\$15**

MICRO FOCUS

- STANDARD CIS COBOL** — ANSI '74 COBOL standard compiler fully validated by U.S. Navy tests to ANSI level 1. Supports many features to level 2 including dynamic loading of COBOL modules and a full ISAM file facility. Also, program segmentation, interactive debug and powerful interactive extensions to support protected and unprotected CRT screen formatting from COBOL programs used with any dumb terminal. **\$850/\$50**
- FORMS 2** — CRT screen editor. Output is COBOL data descriptions for copying into CIS COBOL programs. Automatically creates a query and update program of indexed lists using CRT protected and unprotected screen formats. No programming experience needed. Output program directly compiled by STANDARD CIS COBOL. **\$200/\$20**

EIDOS SYSTEMS

- KISS** — Keyed Index Sequential Search. Offers complete Multi-Keyed Index Sequential and Direct Access file management. Includes built-in utility functions for 16 or 32 bit arithmetic, string/integer conversion and string comparison. Delivered as a relocatable linkable module in Microsoft format for use with FORTRAN-80 or COBOL-80, etc. **\$335/\$23**
- KBASIC** — Microsoft Disk Extended BASIC version 4.51 integrated by implementation of nine additional commands in language. Package includes KISS.REL as described above, and a sample mail list program. To licensed users of Microsoft BASIC-80 (MBASIC) **\$435/\$45**
- XYBASIC** Interactive Process Control BASIC — Full disk BASIC features plus unique commands to handle byte rotate and shift and to test and set bits. Available in several versions:
 - Integer ROMable **\$350/\$25**
 - Integer ROM **\$350/\$25**
 - Integer CP/M **\$350/\$25**
 - Extended ROMable **\$450/\$25**
 - Extended ROM squared **\$450/\$25**
 - Extended CP/M **\$350/\$25**
 - Integer CP/M Run Time Compiler **\$350/\$25**
 - Extended CP/M Run Time Compiler **\$450/\$25**

- RECLAIM** — A utility to validate media under CP/M. Program tests a diskette or hard disk surface for errors, reserving the imperfections in invisible files, and permitting continued usage of the remainder. Essential for any hard disk. Requires CP/M version 2. **\$80/\$5**

- BASIC UTILITY DISK** — Consists of: (1) CRUNCH-14 — Compacting utility to reduce the size and increase the speed of programs in Microsoft BASIC 4.51, BASIC-80 and TRS-80 BASIC, (2) DFUN — Double precision subroutines for computing nineteen transcendental functions including square root, natural log, log base 10, sine, arc sine, hyperbolic sine, hyperbolic arc sine, etc. Furnished in source on diskette and documentation. **\$50/\$25**

- STRING-80** — Character string handling subroutines for direct CP/M BDOS calls from FORTRAN and other compatible Microsoft languages. The utility library contains routines that enable programs to chain to a COM file, retrieve complete character strings, and search file directories with full wild card facilities. Supplied as linkable modules in Microsoft format. **\$95/\$20**

- STRING-80** source code available separately **\$295/NA**
- THE STRING BIT** — FORTRAN character string handling. Routines to find, fill, pack, move, separate, concatenate and compare character strings. This package completely eliminates the problems associated with character string handling in FORTRAN. Supplied with source. **\$65/\$15**

- VSORT** — Versatile sort/merge system for fixed length records with fixed or variable length fields. VSORT can be used as a stand-alone package or loaded and called as a subroutine from CBASIC-2. When used as a subroutine, VSORT maximizes the use of buffer space by saving the TPA on disk and restoring it on completion of sorting. Records may be up to 255 bytes long with a maximum of 5 fields. Upper/lower case translation and numeric fields supported. **\$175/\$20**

- CPM/374X** — Has full range of functions to create or re-name an IBM 3741 volume, display directory information and edit the data set contents. Provides full file transfer facilities between 3741 volume formats and CP/M files. **\$195/\$10**

- BSTAM** — Utility to link one computer to another also equipped with BSTAM. Allows file transfers at full data speed (no conversion to hex), with CRC block control check for very reliable error detection and automatic retry. We use it! It's great! Full wildcard expansion to send *.COM, etc. 9600 baud with wire. 300 baud with phone connection. Both ends need one. Standard and 6 versions can talk to one another. **\$150/\$10**

- WHATISIT?** — Interactive data-base system using associative tags to retrieve information by subject. Hashing and random access used for fast response. Requires CBASIC-2. **\$175/\$25**

- SELECTOR II-C2** — Data Base Processor to create and maintain multi Key data bases. Key tags sorted reports with numerical summaries or mailing labels. Comes with sample applications, including Sales Activity, Inventory, Payables, Receivables, Check Register and Client/Patient Appointments, etc. Requires CBASIC-2. Supplied in source. **\$295/\$20**

- GLECTOR** — General Ledger option to SELECTOR II-C2. Interactive system provides for customized COA. Unique chart of transaction types insure proper double entry bookkeeping. Generates balance sheets, P&L statements and journals. Two year record allows for statement of changes in financial position report. Supplied in source. Requires SELECTOR II-C2, CBASIC-2 and 56K system. **\$350/\$25**

Prices and specifications subject to change without notice.

Prices reflect distribution on 8" single density diskettes. If a format is requested which requires additional diskettes, a surcharge of \$5 per additional diskette will be added. A surcharge of \$25 will be added for software on CSSN format DC 300XL cartridges. Media charge for 5440 disk is \$100.

- CBS** — Configurable Business System is a comprehensive set of programs for defining custom data files and application systems without using a programming language such as BASIC, FORTRAN, etc. Multiple key fields for each data file are supported. Set-up program customizes system to user's CRT and printer. Provides fast and easy interactive data entry and retrieval with transaction processing. Report generator program does complex calculations with stored and derived data, record selection with multiple criteria, and custom formats. Sample inventory and mailing list systems included. No support language required. **\$295/\$40**

MICRO DATA BASE SYSTEMS

- HDBS** — Hierarchical Data Base System. CODASYL oriented with files, SETS, RECORDS and ITEMS which are all user defined. ADD, DELETE, UPDATE, SEARCH, and TRAVERSE commands supported. SET ordering is sorted, FIFO, LIFO, next or prior. One to many set relationship supported. Read/write protection at the FILE level. Supports FILES which extend over multiple floppy or hard disk devices.
- MDBS** — Micro Data Base System. Full network data base with all features of HDBS plus multi-level read/write protection for FILE, SET, RECORD and ITEM. Explicit representation of one to one, one to many, many to many, and many to one SET relationships. Supports multiple owner and multiple record types within SETs. HDBS files are fully compatible.
- HDBS-Z80** version **\$250/\$40****
- MDBS-Z80** version **\$750/\$40****
8080 version available at \$75 extra.

When ordering, specify one of the language interfaces listed below. Additional language interfaces available at time of purchase for \$100 or \$125 if purchased later.

**The single manual covering HDBS and MDBS when purchased alone comes without specific language interface manual. Manuals are available for the following Microsoft languages:

- 1) MBASIC 4.51, 2) BASIC-80 5.0, 3) Compiled BASIC or FORTRAN-80, 4) COBOL-80, 5) MACRO-80 **\$NA/\$10**

MICROPRO

- SUPER-SORT I** — Sort, merge, extract utility as absolute executable program or linkable module in Microsoft format. Sorts fixed or variable records with data in binary, BCD, Packed Decimal, EBCDIC, ASCII, floating, fixed point, exponential, field justified, etc. Even variable number of fields per record. **\$225/\$25**
- SUPER-SORT II** — Above available as absolute program only. **\$175/\$25**
- SUPER-SORT III** — As II without SELECT/EXCLUDE. **\$125/\$25**
- DATASAR** — Professional forms control entry and display system for key-to-disk data capture. Menu driven with built-in learning aids. Input field verification by length, mask, attribute (i.e. upper case, lower case, numeric, auto-dup, etc.). Built-in arithmetic capabilities using keyed data, constant and derived values. Visual feedback for ease of forms design. Files compatible with CP/M-MP/M supported languages. Requires 32K CP/M. **\$350/\$35**
- WORD-STAR** — Menu driven visual word processing system to work with standard terminals. Text formatting performed on screen. Facilities for text pagination, page number, justify, center, underline, etc. User can print one document while simultaneously editing a second. Edit facilities include global search and replace, Read/Write, Undo, etc. Requires CRT terminal with addressable cursor positioning. **\$445/\$40**
- WORD-STAR Customization Notes** — For sophisticated users who do not have one of the many standard terminal or printer configurations in the distribution version of WORD-STAR. **NA/\$95**
- WORD-MASTER Text Editor** — In one mode has super-set of CP/M's ED commands including global searching and replacing, forwards and backwards in file in video mode, provides full screen editor for users with serial addressable cursor terminal. **\$145/\$25**

- TEXTWRITER III** — Text formatter to justify and paginate letters and other documents. Special features include insertion of text during execution from other disk files or console, permitting recipe documents to be created from linked fragments on other files. Has facilities for sorted index, table of contents and footnote insertions. Ideal for contracts, manuals, etc. Now compatible with Electric Blue* printer. **\$125/\$20**

Non-applications software for Microsoft's BASIC interpreter.

PEACHTREE SOFTWARE

- GENERAL LEDGER** — Records details of all financial transactions. Generates a balance sheet and an income statement. Flexible and adaptable design for both small businesses and firms performing client writeup services. Produces reports as follows: Trial Balance, Transaction Registers, Balance Sheet, Prior Year Comparative Balance Sheet, Income Statement, Prior Year Comparative Income Statement and Department Income Statements. Interactive with other PEACHTREE accounting packages. Supplied in source code for Microsoft BASIC. **\$990/\$30**

Reader Service index—page 241

Lifeboat Associates, 1651 Third Avenue, N.Y., N.Y. 10028 (212) 860-0300 Telex: 220501

*The Software Supermarket is a trademark of Lifeboat Associates

PAYABLES — Tracks current aged payables and incorporates a check writing feature.

MAINTAINS a complete vendor file with information on purchase orders and discount terms as well as active account status. Procedures are as follows: Open Voucher Report, Accounts Payable Aging Report and Cash Requirements. Provides input to PEACHTREE General Ledger. Supplied in source code for Micro-soft BASIC. **\$990/\$30**

ACCOUNTS RECEIVABLE — Generates invoice register and complete monthly statements. Tracks current aged receivables. Maintains customer file including credit information and account status. The current status of any customer account is instantly available. Produces reports as follows: Aged Accounts Receivable, Invoice Register, Payment and Adjust-ment Register and Customer Account Status Report. Provides input to PEACHTREE General Ledger. Sup-plied in source code for Microsoft BASIC. **\$990/\$30**

PAYROLL — Prepares payroll for hourly, salaried and commissioned employees. Generates monthly, quar-terly and annual returns. Prepares employee W-2's. Includes tables for federal withholding and FICA as well as withholding for all 50 states plus up to 20 cities from pre-computed or user generated tables. Will print checks, Payroll Register, Monthly Summary and Unemployment Tax Report. Provides input to PEACHTREE General Ledger. Supplied in source code for Microsoft BASIC. **\$990/\$30**

INVENTORY — Maintains detailed information on each inventory item including part number, descrip-tion, unit of measure, vendor and reorder data, item activity and complete information on current item costs, pricing and sales. Produces reports as follows: Physical Inventory Worksheet, Inventory Price List, Departmental Summary Report, Inventory Status Re-port, The Reorder Report and the Period-to-Date and Year-to-Date reports. Supplied in source code for Microsoft BASIC. **\$1190/\$30**

GRAHAM-DORIAN SOFTWARE SYSTEMS

Comprehensive accounting software written in CBASIC-2 and supplied in source code. Each soft-ware package can be used as a stand-alone system or integrated with the General Ledger for automatic posting to ledger accounts. Requires CBASIC-2

GENERAL LEDGER **\$995/\$35**
ACCOUNTS PAYABLE **\$995/\$35**
ACCOUNTS RECEIVABLE **\$995/\$35**
INVENTORY SYSTEM **\$590/\$35**
JOB COSTING **\$995/\$35**
APARTMENT MANAGEMENT **\$990/\$35**
CASH REGISTER **\$995/\$35**

POSTMASTER — A comprehensive package for mail list maintenance that is completely menu driven. Features include keyed record extraction and label production. A form builder program is included which provides neat letters on single sheet or continu-ous forms. Compatible with NAD files. Requires CBASIC-2. **\$150/\$15**

STRUCTURED SYSTEMS GROUP

GENERAL LEDGER — Interactive and flexible system providing proof of audit outputs. Customization of COA created interactively. Multiple branch account-ing centers. Extensive checking performed at data entry for proof, COA correctness, etc. Journal entries may be batched prior to posting. Closing procedure automatically backs up input files. Now includes Statement of Changes in Financial Position. Requires CBASIC-2. **\$1250/\$25**

ACCOUNTS RECEIVABLE — Open item system with output for internal aged reports and customer-orien-ted statement and billing purposes. On-Line En-quiry permits information for Customer Service and Credit departments. Interface to General Ledger pro-vided if both systems used. Requires CBASIC-2. **\$1250/\$25**

ACCOUNTS PAYABLE — Provides aged statements of accounts by vendor with check writing for selected invoices. Can be used alone or with General Ledger and/or with NAD. Requires CBASIC-2. **\$1250/\$25**

PAYROLL — Flexible payroll system handles weekly, bi-weekly, semi-monthly and monthly payroll periods. Tips, bonuses, reimbursements, advances, sick pay, vacation pay, and compensation time are all part of the payroll records. Prints government required peri-odic reports and will post to multiple SSG General Ledger accounts. Requires CBASIC-2 and 54K of memory. **\$1250/\$25**

INVENTORY CONTROL SYSTEM — Performs control functions of adding and deleting stock items, add-ing new items and deleting old items. Tracks quantity of items on hand, on order and back-ordered. Op-tional hard copy audit trail is available. Reports in-clude Master Item List, Stock Activity, Stock Valua-tion and Re-order List. Requires CBASIC-2 **\$1250/\$25**

ANALYST — Customized data entry and reporting sys-tem. User specifies up to 75 data items per record. Interactive data entry, retrieval, and update facility makes information management easy. Sophisticated report generator provides customized reports using selected records with multiple level break-points for summarization. Requires a disk and software such as OSORT, SUPER-SORT or VSORT and CBASIC-2. **\$250/\$15**

LETTERRIGHT — Program to create, edit and type let-ters or other documents. Has facilities to enter, dis-play, delete and move text, with going to screen presentation. Designed to integrate with NAD for form letter mailings. Requires CBASIC-2. **\$200/\$25**

NAD Name and Address selection system — Interactive mail list creation and maintenance program with output as full reports with reference data or restricted information for mail labels. Transfer system for ex-traction and transfer of selected records to create new files. Requires CBASIC-2. **\$100/\$20**

OSORT — Fast sort/merge program for files with fixed record length, variable field length information. Up to five ascending or descending keys. Full back-up of input files created. **\$100/\$20**

NEW! NEW! NEW! NEWSLETTER FROM LIFEBOAT

- Latest Version
Numbers List
of Software
- Update on
CP/M Users Group
- The Great ZOSO Speaks
Out from Behind the Scenes

\$18 ppd. for 12 issues (U.S., Canada, Mexico). Elsewhere **\$40**. Send Check to "Lifelines," 1651 Third Avenue, New York, N.Y. 10028 or use your VISA or MasterCard—call (212) 722-1700

Copyright © 1980 Lifeboat Associates. No portion of this advertisement may be repro-duced without prior permission.

CONDIMENTS

HEAD CLEANING DISKETTE — Cleans the drive Read/Write head in 30 seconds. Diskette absorbs loose oxide particles, fingerprints and other foreign particles that might hinder the performance of the drive head. Lasts at least 3 months with daily use. Specify 5" or 8".
 Single sided **\$20 each/\$5 for 3**
 Double sided **\$25 each/\$65 for 3** **\$12.50**

FLIPPY DISK KIT — Template and instructions to modify single sided 5 1/4" diskettes for use of second side in single sided drives. **\$12.50**

FLOPPY SAVER — Protection for center holes of 5" and 8" floppy disks. Only 1 needed per diskette. Kit contains centering post, pressure tool and tough 7 mil mylar reinforcing rings for 25 diskettes.
 5" Kit **\$14.95**
 8" Rings only **\$7.95**
 8" Kit **\$16.95**
 8" Rings only **\$8.95**

PASCAL USER MANUAL AND REPORT — By Jensen and Wirth. The standard textbook on the language. Recommended for use by Pascal/Z, Pascal/M and Pascal/MT users. **\$12**

THE C PROGRAMMING LANGUAGE — By Kernighan and Ritchie. The standard textbook on the language. Recommended for use by BDS C, tiny C, and Whitesmiths C users. **\$12**

STRUCTURED MICROPROCESSOR PROGRAMMING — By the authors of SMAL/80. Covers structured programming, the 8080/8085 instruction set and the SMAL/80 language. **\$20**

ACCOUNTS PAYABLE & ACCOUNTS RECEIVABLE—CBASIC — By Osborne/McGraw-Hill. **\$20**

GENERAL LEDGER—CBASIC — By Osborne/McGraw-Hill. **\$20**

LIFEBOAT DISK COPYING SERVICE — Transfer data or programs from one media format to another at a moderate cost. **from \$25**

Hearty Appetite.

*CP/M and MP/M are trademarks of Digital Research. Z80 is a trademark of Zilog, Inc. UNIX is a trademark of Bell Laboratories. WHATSIT? is a trademark of Computer Headware. Electric Pencil is a trademark of Michael Shryver Software. TRS-80 is a trademark of Tandy Corp. Pascal/M is a trademark of Sorcim.

†Recommended system configuration consists of 48K CP/M, 2 full size disk drives, 24 x 80 CRT and 132 column printer.

‡Modified version available for use with CP/M as implemented on Heath and TRS-80 Model I computers.

④ User license agreement for this product must be signed and returned to Lifeboat Associates before shipment may be made.

⑤ This product includes/excludes the language manual recommended in Condiments.

⑥ Serial number of CP/M system must be supplied with orders.

⑦ Requires Z80 CPU.

Ordering Information

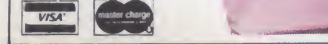
MEDIA FORMAT ORDERING CODES
 When ordering, please specify format code.

LIFEBOAT ASSOCIATES MEDIA FORMATS LIST

Diskette, cartridge disk and cartridge tape format codes to be specified when ordering software for listed computer or disk systems. All software products have specific requirements in terms of hardware or software support, such as MPU type, memory size, support operating system or language.

Computer system	Format Code	Computer system	Format Code
Altair 8800 Disk	See MITS 3200	RAIR Double Density	RE
Altos	A1	Research Machines 8"	A1
Apple + Microsoft SoftCard	RO	Research Machines 5 1/4"	RO
BASF System 7100	RO	REX	RO
Blackhawk Single Density	Q1	SD Systems 8"	A1
Blackhawk Microplus Mod II	Q2	SD Systems 5 1/4"	Q3
CDS Versatile 3B	Q2	Sorcerer	See Exidy Sorcerer
CDS Versatile 4	Q2	Spacelyte	A1
COMPAL-80	Q2	SuperBrain	See Interlec
Commodore System 3	A1	Tarbell	A1
Cromemco 22D	R2	TEI 5 1/4"	Q3
CSDN BACKUP (tape)	T#	TEI 8"	A1
Delta	A1	Thinklogix	See Morrow Discus
Digital Microterm II	RD	TRS-80 Model I 5 1/4"	R2
Logi Microsystems	A1	TRS-80 Model I + REC Freedom	RN
Discus	See Morrow Discus	TRS-80 Model I + Micromation	A4
Durango F-85	RL	TRS-80 Model I + Omikron 5 1/4"	RM
Dynalite DB2/2	R1	TRS-80 Model I + Omikron 8"	A1
Dynalite DB8/4	A1	TRS-80 Model I + Shuffleboard 8"	A1
Exidy Sorcerer + Lifeboat CP/M	Q2	TRS-80 Model II	A1
Exidy Sorcerer + Exidy CP/M	Q4	VDP-40/42/44/80	See IM&I
Heath HB + HIT/H2T	P4	Vector M2	Q2
Heath 88 + Lifeboat CP/M	P4	Versatile	See CDS Versatile
Heath 88 + Magnolia CP/M	P7	Vista V80 5 1/4" Single Density	P5
Helios II	See Processor Technology	Vista V200 5 1/4" Double Density	P6
Horizon	See North Star	Zenith 280 + Lifeboat CP/M	P4
ICOM 2411 Micro Floppy	R3	Zenith 280 + Magnolia CP/M	P7
ICOM 3712	A1		
ICOM 3812	A1		
ICOM 4511 5440 Cartridge	D1		
ICOM 4511 5440 Cartridge CP/M 2	D2		
IMS 8000	RA		
IMSAI VDP-40	R4		
IMSAI VDP-44	R5		
IMSAI VDP-48	A1		
Intelec	See ISC Intelec		
Intel MDS Single Density	A1		
Interlec SuperBrain DOS 0.1	R7		
Interlec SuperBrain DOS 0.5-2-X	R3		
Interlec SuperBrain DOS 3-X	RK		
ISC Intelec 8063/8360/8963	A1		
Kontrol PSI-80	RF		
Meca 5 1/4"	P6		
Micromation (Except TRS-80 below)	A1		
Microplus Mod I	Q1		
Microplus Mod II	Q2		
MITS 3200/3202	B1		
Morrow Discus	A1		
Mostek	A1		
MSD 5 1/4"	RC		
North Star Single Density	P1		
North Star Double/Quad	P2		
Nytec Single Density	Q3		
Nytec Microplus Mod. II	Q2		
Ohio Scientific C3	A3		
Oxye CR001	T2		
Perlec PCC 2000	A1		
Processor Technology Helios II	R2		
RAIR Single Density	RE		

Prices F.O.B. New York. Shipping, handling and C.O.D. charges extra. Manual cost applicable against price of subsequent software purchase. The sale of each proprietary software package conveys a license for use on one system only.



ELCOMP Books

Care and Feeding of the Commodore PET
 Eight chapters exploring PET hardware. Includes repair and interfacing information. Programming tricks and schematics.
Order No. 150 \$11.00

8K Microsoft BASIC Reference Manual
 Authoritative reference manual for the original Microsoft 4K and 8K BASIC developed for Altair and later computers including PET, TRS-80, and OSI. OSI owners please take note!
Order No. 151 \$ 9.95

Expansion Handbook for 6502 and 6802
 (S-44 Card Manual) Describes all of the 4.5 x 6.5 44 pin S-44 cards incl. RAM, ROM, dig. I/O, MUX/A to D, EPROM Prog. etc. With schematics and funct. descriptions. A must for every KIM, SYM and AIM owner.
Order No. 152 \$ 9.95

Microcomputer Application Notes
 Reprint of Intel's most important application notes, including 2708, 8085, 8255, 8251 chips. Very necessary for the hardware buff.
Order No. 153 \$ 9.95

Complex Sound Generation
 New, revised applications manual for the Texas Instruments SN 76477 Complex Sound Generator. Circuit board available (\$8.95)
Order No. 154 \$ 6.95

Small Business Programs
 Complete programs for the business user. Mailing List, Inventory, Invoice Writing and much more. Introduction into Business Applications. Many listings.
Order No. 156 \$14.90

The First Book of Ohio Scientific, Vol. I
 Contains an introduction to personal computers and describes the Ohio Scientific Line. Contains explanatory diagrams: block, hook-up, expansion, tricks, hints and many interesting listings. Hardware and software information not previously available in one compact source. 192 pages
Order No. 157 \$ 7.95

The First Book of Ohio Scientific, Vol. II
 Vol. II contains very valuable information about Ohio Scientific microcom-puter systems. Introduction to OS 65D and OS65-U, networking and dis-tributed processing, systems specifications, business applications, hard and software hints and tips.
Order No. 158 \$ 7.95

Mailing List Program for Challenger C1/C2 8K
Order No. 2004 - Personal Version \$ 9.95
Order No. 2005 - Business Version \$ 9.95

Ohio Scientific Expansion Information
 Conversion of CIP (Cassette) to 52x26 display. Detailed step by step in-structions for doubling the CIP speed and display size!
Order No. 1105 \$12.00

Important Software for CBM 16K/32K
 Most powerful Editor/Assembler for Commodore CBM 16/32K on cassette. Very fast—Editor divides screen into 3 parts. Scrolling text window, 24 direct commands, 19 serial commands, status and error messages. As-sembler can be started directly from the editor or from the TIM-monitor. Translates in three passes. If an error is encountered, automatic return to the editor. Cassette with DEMO.
Order No. 3276 \$69.00

ATTENTION APPLE USERS
 Same as above for Apple II or Apple II plus.
Order No. 3500 \$89.00

MONJANA/1 makes Machine Language Programming easy!
 In every Commodore CBM there is a spare ROM socket waiting for its MONJANA/1. The new MONJANA/1 Machine Language Monitor in ROM offers more user guidance and debugging aids than any other monitor available today. It is indispensable for anyone intending to take full ad-vantage of the computers features. Trace, link, disassemble, dump, re-late, line assemble and much more. Every command function has de-mand printout option. Price includes extensive manual
Order No. 2001 \$98.00

JANA-Monitor on cassette for the PET
 Similar to MONJANA/1 - very powerful
Order No. 2002 \$29.00

ELCOMP PUBLISHING Inc. 116
 3873-L Schaefer Ave., Chino CA 91710 (714) 591-3130

Please send me the books/software indicated below

☐ I enclose \$ _____ send postpaid
☐ Send COD (\$5 extra)
☐ Charge my ☐ VISA ☐ Mastercharge

Acct. No. _____

Expir. date _____ Signature _____

Book No. _____ Book No. _____ Software No. _____

☐ 1 Year subscription to ELCOMP Newsletter \$9.80

Name _____ Phone _____

Address _____

City _____ State _____ Zip _____

CA add 6% sales tax. We also accept Eurocheck. All orders outside USA must add 15% shipping.

Lifeboat Associates
THE SOFTWARE SUPER-MARKET

Memory-Checking Program for the 1802

This simple program will sniff out defective chips.

John R. Bunn
MOTU 7 PO Box 105
FPO Seattle, WA 98762

I bought a basic Elf II micro-computer from Netronics, Ltd., 333 Litchfield Rd., New Milford, CT 06776, and slowly added to it as I learned more about it. Now I have the monitor board, 8K of RAM, ASCII keyboard, Tiny BASIC and various software support. With the rf and if sections removed, a nine-inch solid-state TV serves as my monitor. The biggest problem I have with my new hobby is finding time to do things I want. Software support for the 1802 is still in its infancy, and you have to write most programs yourself.

All was going well with my Elf II until I noticed that Tiny BASIC would not work on large programs. The problem was on one of the 4K RAM boards, and I could have just swapped chips to locate the defective one. Instead, I wrote a simple memory-checking program using what I learned from working with my Elf II. The resulting 157-byte pro-

gram fits in the original 256 bytes of RAM and may be used to check one byte of memory or as many bytes as you have. Fig. 1 is a flowchart of the program, and Program 1 is the machine-language listing. The program goes into memory locations 0010 to 0098, but you can put it on any page by changing the address at 0011.

After initialization, the program turns on the Q LED and waits for data input. First, the number of bytes of memory to be checked is entered, high order and then low order. Second, the starting address is entered, high address and then low address. For example, to check one page of memory starting at page 07, enter 00 FF 07 00. As the data is entered, the hex display echoes it, and once all the data is entered, the Q will go out and the program will run the memory check.

If all the memory locations can store all the test words, the Q LED flashes at a rapid rate. If a memory location fails to store a test word, the Q LED flashes at a slow rate, and the hex display shows the error address. When

the Q LED is on, the high address shows on the hex display; when the Q led is off, the low address shows.

The program runs at 0010. Be careful to enter the input data

correctly or disaster will most likely occur when the program runs. The memory check program found my trouble, a defective chip at location 17B3. It is a simple but effective program. ■

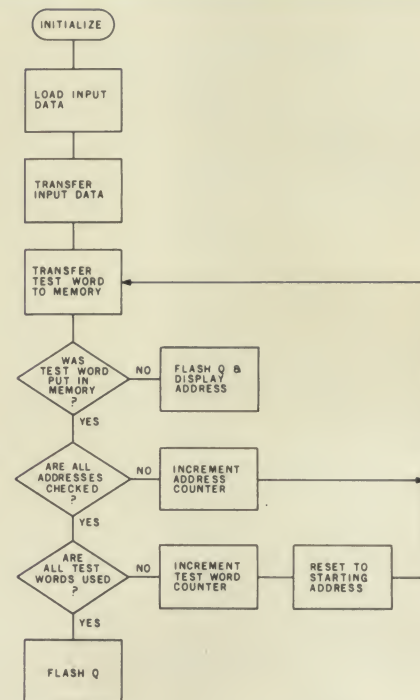


Fig. 1.

0010	F8	00	BF	BE	BD	F8	AC	AF	F8	AB	AE	F8	9A	AD	F8	04
0020	AA	F8	0D	A9	EE	F8	01	73	FE	73	FE	73	FE	73	FE	73
0030	FE	73	FE	73	FE	73	F8	AA	73	F8	00	73	F8	FF	73	F8
0040	55	73	7B	EF	37	44	3F	46	6C	64	2A	8A	3A	44	7A	F8
0050	AC	AF	EF	72	BB	72	AB	EF	72	BC	72	AC	EC	0E	5C	F3
0060	32	7A	8C	5D	1D	9C	5D	2D	ED	7A	64	F8	60	B8	28	98
0070	3A	6E	31	69	7B	64	2D	2D	30	6B	EB	2B	8B	3A	89	9B
0080	3A	89	29	89	32	8C	1E	30	4F	1C	30	5C	7A	F8	10	B8
0090	28	98	3A	90	31	8C	7B	30	8D							

Program 1.

THE ORIGINAL MAGAZINE FOR OWNERS OF THE TRS-80™* MICROCOMPUTER

SOFTWARE
TRS-80™
OWNERS

COMPUTRONICS INC.

MONTHLY
NEWSMAGAZINE
FOR TRS-80™
OWNERS

MONTHLY NEWSMAGAZINE Practical Support For Model I & II

- PRACTICAL APPLICATIONS
- BUSINESS
- GAMBLING • GAMES
- EDUCATION
- PERSONAL FINANCE
- BEGINNER'S CORNER
- NEW PRODUCTS
- SOFTWARE EXCHANGE
- MARKET PLACE
- QUESTIONS AND ANSWERS
- PROGRAM PRINTOUTS
- AND MORE

PROGRAMS AND ARTICLES PUBLISHED IN OUR FIRST 12 ISSUES INCLUDE THE FOLLOWING:

- A COMPLETE INCOME TAX PROGRAM (LONG AND SHORT FORM)
- INVENTORY CONTROL
- STOCK MARKET ANALYSIS
- WORD PROCESSING PROGRAM (FOR DISK OR CASSETTE)
- LOWER CASE MODIFICATION FOR YOUR VIDEO MONITOR OR PRINTER
- PAYROLL (FEDERAL TAX WITHHOLDING PROGRAM)
- EXTEND 16-DIGIT ACCURACY TO TRS-80™ FUNCTIONS (SUCH AS SQUARE ROOTS AND TRIGONOMETRIC FUNCTIONS)
- NEW DISK DRIVES FOR YOUR TRS-80™
- PRINTER OPTIONS AVAILABLE FOR YOUR TRS-80™
- A HORSE SELECTION SYSTEM***ARITHMETIC TEACHER
- COMPLETE MAILING LIST PROGRAMS (BOTH FOR DISK OR CASSETTE SEQUENTIAL AND RANDOM ACCESS)
- RANDOM SAMPLING***BAR GRAPH
- CHECKBOOK MAINTENANCE PROGRAM
- LEVEL II UPDATES***LEVEL II INDEX
- CREDIT CARD INFORMATION STORAGE FILE
- BEGINNER'S GUIDE TO MACHINE LANGUAGE AND ASSEMBLY LANGUAGE
- LINE RENUMBERING
- AND CASSETTE TIPS, PROGRAM HINTS, LATEST PRODUCTS COMING SOON (GENERAL LEDGER, ACCOUNTS PAYABLE AND RECEIVABLE, FORTRAN 80, FINANCIAL APPLICATIONS PACKAGE, PROGRAMS FOR HOMEOWNERS, MERGE TWO PROGRAMS, STATISTICAL AND MATHEMATICAL PROGRAMS (BOTH ELEMENTARY AND ADVANCED) ... AND

FREE

WORD PROCESSING PROGRAM (Cassette or Disk) For writing letters, text, mailing lists, etc., with each new subscriptions or renewal.

LEVEL II RAM TEST (Cassette or Disk) Checks random access memory to ensure that all memory locations are working properly.

DATA MANAGEMENT SYSTEM (Cassette or Disk) Complete file management for your TRS-80™

CLEANUP (Cassette or Disk) Fast action Maze Game

ADVENTURE (Cassette or Disk) Adventure #0 by Scott Adams (From Adventureland International)

* TRS-80™ IS A TRADEMARK OF TANDY CORP.

FREE

SEND FOR OUR NEW 48 PAGE SOFTWARE CATALOG (INCLUDING LISTINGS OF HUNDREDS OF TRS-80™ PROGRAMS AVAILABLE ON CASSETTE AND DISKETTE). \$2.00 OR FREE WITH EACH SUBSCRIPTIONS OR SAMPLE ISSUE.

COMPUTRONICS INC.
MATHEMATICAL APPLICATIONS SERVICE™

Box 149

New City, New York 10956



24 HOUR
ORDER
LINE

(914) 425-1535



NEW TOLL-FREE
ORDER LINE

(OUTSIDE OF N.Y. STATE)

(800) 431-2818

ONE YEAR SUBSCRIPTION \$24

TWO YEAR SUBSCRIPTION \$48

SAMPLE OF LATEST ISSUE \$ 4

START MY SUBSCRIPTION WITH ISSUE

(#1 - July 1978 • #7 - January 1979 • #12 - June 1979 • #18 - January 1980)

NEW SUBSCRIPTION RENEWAL

CREDIT CARD NUMBER EXP. DATE

SIGNATURE

NAME

ADDRESS CITY STATE ZIP

*** ADD \$6/YEAR (CANADA, MEXICO) - ADD \$12/YEAR AIR MAIL - OUTSIDE OF U.S.A., CANADA & MEXICO ***



✓ 70

Send for
FREE CATALOG!



M-451



BUSINESS CONTROL PROGRAMS

FROM THE ORIGINATOR OF THE TRS-80® PROJECT



P.O. Box 16020
Ft. Worth, TX
76133
(817) 294-2510



THE PASCAL/MT^{As Low As} \$250.00

- Compiler executes under the CP/M operating system in as little as 32 K bytes of RAM
- Interactive Symbolic Debugger which enables the programmer to examine variables, set a breakpoint, and trace procedure calls interactively at run time
- Compiles at the rate of 600 lines per minute on a 2 MHz 8080
- Programs Execute up to 10 TIMES FASTER than popular interpretive Pascals
- The code generated is 8080 object code which is ROMable with a minimum run time overhead of 1.5K bytes
- Interrupt procedures allow the pro-

- grammer to write interrupt drivers for I/O and other real time tasks in Pascal/MT
- Bit manipulations of variables may be performed with the built-in procedures. SETBIT, CLRBIT, TSTBIT, SHL, SHR, SWAP, LO, HI
- Assembly language subroutines may be called from Pascal/MT
- Business arithmetic version of Pascal/MT is also available
- Pascal data structures supported are: ENUMERATION AND SUBRANGE TYPES, RECORD, ARRAY, REAL, INTEGER, CHAR, and BOOLEAN
- Not implemented are: SETS, GOTO, GET, PUT

CP/M® 2

- Enhanced Upward Compatible File System
- Powerful New Random Access Capabilities

FMG Corporation now offers the CP/M 2.2 for the TRS-80 Model II. From minidisks, floppy disks, all the way to high-capacity hard disks, the flexibility of CP/M 2.2 makes it a truly universal operating system. The package includes an 8" system disk, editor, assembler and debugger for the TRS-80 Model II.

AS LOW AS \$200.00

BUSINESS

- General Ledger
- Payroll
- Accounts Payable
- Accounts Receivable

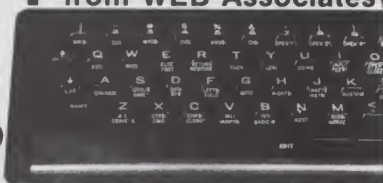
These business systems are designed with the business manager in mind! Totally screen oriented, they give complete user prompting as each entry is required. Major changes in your current book-keeping method are not necessary to make these programs work for you.

AS LOW AS \$250.00

CP/M is a registered trademark of Digital Research Corp. TRS-80 is a registered trademark of Radio Shack.

TSHORTTM from WEB Associates

THE MOST
POWERFUL
BASIC
SHORTHAND
EVER!



TRS-80 Keyboard with decals installed.

- 11 "SAVEABLE" KUSTOM keys. Ten 10-character and one 64-character.
- 41 preprogrammed LV II and DOS statement keys.
- Complete decal set (see picture) included for both LV II and DOS systems.
- Includes DEBOUNCE and AUTO REPEAT.
- Hold "SHIFT" or "CLEAR" and press desired key — entire statement is typed on screen.
- Includes LOWER CASE DRIVER. "@" key substitutes for "SHIFT."
- Less than 1K bytes machine language, relocatable in hi or low memory.
- Features self-entering commands. I.E. CONT; GOTO10; KUSTOM.
- Includes comprehensive instruction manual.

TSHORT + (one cassette includes Level II & single drive DOS) \$ 19.95

TSHORT + on formatted diskette (DOS only, requires 2 or more drives) \$ 24.95

Send Check or Money Order to:
Phone Orders:
(714) 760-9424
(714) 494-2869
Dealer Inquiries Invited
UPS/COD — Add \$3.00

WEB ASSOCIATES
MARKETING CENTER
95 Emerald Bay
Laguna Beach, CA 92651
(Calif. Residents add 6% tax)

✓ 240



SEND FOR FULL LINE CATALOG

CompuCover®



COVER YOUR INVESTMENT

- Cloth Backed Naugahyde Vinyl
- Improved Reliability
- Longer Life

- Waterproof & Dustproof
- Two Decorator Colors
Saddle Tan • Black

TRS-80 MODEL II Entire Unit \$22.95 Keyboard Only 7.95	Full Apple II Apple II Keyboard 9.95 Apple II Disk 3.95	HAZELTINE 1400 1410 1500 1510 1520 1552 \$18.95 Soroc IG 120 7.99 Addis Terminal 18.95 25 100 980 etc 19.95 ADM 3 14.95 Video 100 9.95	Centronics Printers 700 701 702 703 19.95 P1 730 737 9.95 779 17.95 T 1 800 Series 19.95 Trendcom 100 & 200 9.95 Decriver III 19.95 I D S 440 12.95
TRS-80 MODEL I Keyboard \$7.95 Cassette 4.95 Video Display 9.95 Package Offer 19.95 *Note: Add \$3.00 for EXPANSION INTER	Pet Computer \$12.95 Pet 2040 Disk 12.95 Pet 2022 Printer 9.95 Pet 2023 Printer 9.95	Vector MZ \$14.95 N. Star Horizon 14.95 CompuColor II 18.95 H. P. 85 14.95 OSI CAP 14.95 Diablo Printers 9.95	TRS-80 Disk \$4.95 Double Disk 7.95 Percum Disk 4.95 MPI B51 B52 4.95 Lobo Mini Disk 6.95 Matchless Mini 6.95 Vista Mini Disk 6.95
Line Printer I \$17.95 Line Printer II 9.95 Quick Printer I 9.95	NEC Spinwriter Keyboard Models \$15.95 Diablo Printers 15.95 Keyboard Models 15.95		

Send check or money order to:
Include \$1.00 for postage and handling.
Overseas orders include \$3.00 postage.
DEALER INQUIRES INVITED

CompuCover[®] ✓ 90
P.O. Box 324 (Dept. A)
Mary Esther, FL 32569
Phone (904) 243-5793

Chaining Data With the Sorcerer

Don't let your Sorcerer torture you with limited capabilities.

Charles Dailey
3217 NE 54th St.
Vancouver, WA 98663

Filing capabilities were dismal with the 8K Microsoft BASIC that came with my Sorcerer. Exidy has a CSAVE that off-loads a program onto a cassette, but does not save the information entered into the pro-

gram. A CSAVE* is available for off-loading numerical arrays. It is possible to convert strings to numerical data and then save it, but the CSAVE* command lacks the cyclical redundancy-check system that makes the regular CSAVE so reliable. As a result, practical filing capabilities are minimal in Sorcerer with cassette.

The obvious way to save information is to enter it as DATA statements and then extract it with READ/DATA commands. But this means you must set up a closely struc-

tured sequence. In a mailing list, the name, always followed by the address, always followed by the city and zip, is required. Nothing can be skipped. If the zip is not available, you still must make a field for the one not available. This is confining and cumbersome.

Having several hundred 35 mm slides to index and cross-index, I wrote a program to identify any properly titled slide. The key to making this idea work was to input a word that would be found in the title and have the Sorcerer "read" all the data until it found it, then print that data statement. The "reading" would utilize the MID\$(D\$,L,I) command, where D\$ is the data string, L is the loop number and I is the length of the input word or string.

The system worked well, and it was simple to add refinements along the way—a counter terminating in an input command to keep the screen from scrolling, for instance.

The next problem was to figure a way to include more than one data line in the final printout. Slide titles could be stated in one line or less than 50 characters, but not data about equipment and supplies, sources of supply, prices and other relevant information. I needed a way to come back later and add new information without retyping the entire DATA line, so I built upon the plan used for the slide catalog and added the chaining capability.

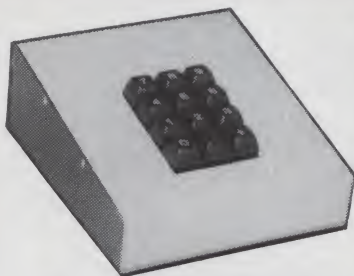
To avoid having to retype the existing DATA line, I decided to begin the lines concatenated to the previous line with a plus sign. Leaving ten program lines between subjects gives you the option of adding nine additional lines of data, or of returning on nine later occasions to update the original data line.

```
100 CLEAR 5000:PRINT:PRINT:GOSUB 4000
300 PRINT "      EQUIPMENT CATALOG" PRINT
500 PRINT "Type in the word to be searched for in CAPITAL LETTERS"
600 PRINT
700 INPUT "      " I$
800 I = LEN(I$):RESTORE
850 FOR L=5 TO 9:E$(L)=CHR$(32):NEXT L
900 GOSUB 4000:C=0
950 PRINT "Checking for "I$
1000 READ D$
1010 IF D$="DONE"AND C<5 THENPRINT:PRINTD$:GOSUB 4050:GOTO 600
1020 IF D$ = "DONE" THEN GOTO 1040
1030 GOTO 1100
1040 PRINT:GOSUB 4400:PRINT D$:GOSUB 4050:GOTO 600
1100 X=LEN(D$):IFLEFT$(D$,1)="+" THENE$=E$+RIGHT$(D$,X-1):GOTO1000

1300 IFLEFT$(D$,1)<>"+"THENGOSUB4200:E$=CHR$(32):E$=D$:GOTO1000
4000 REM SUBROUTINES SECTION *****
4010 PRINT CHR$(12):PRINT:PRINT:RETURN
4020 :
4050 PRINT:PRINT "You may try another word":RETURN
4090 :
4200 FOR L = 1 TO LEN(E$)
4210 IF I$=MID$(E$,L,I) THEN GOSUB 4300:RETURN
4220 NEXT L:RETURN: REM I$ NOT FOUND SO RETURN TO 1300
4240 :
4300 C = C + 1
4320 IF C < 5 THEN PRINT:PRINT E$:RETURN
4340 E$(C) = E$
4360 IF C < 10 THEN RETURN: REM: RETURNS TO 1300
4380 PRINT:PRINT
4400 INPUT "Press RETURN to clear screen and continue listing":Z
4410 GOSUB 4000:PRINT "Checking for "I$:PRINT
4420 FOR L=5 TO 9:PRINT E$(L):PRINT:NEXT L:C=4:RETURN
4510 :
5000 REM ADD DATA HERE
5010 DATA THIS IS A SAMPLE OF THE FIRST LINE OF YOUR DATA
5011 DATA + DO THIS IF YOU WISH TO CONTINUE THE ENTRY
5012 DATA + THIS LINE MAY BE ADDED, TOO.
5020 DATA THE SECOND ENTRY WOULD BEGIN HERE.
5021 DATA + AND THIS COULD BE ADDED TO IT.
9990 DATA LIST BEGINS: REM: THIS MUST REMAIN AT THE END
10000 DATA DONE
```

Program listing.

OSI



BKM'S NUMERIC KEYPAD — \$65

For OHIO SCIENTIFIC
FEATURES

Digits 0-9, Decimal Point, and Return
Terminal Quality Keypad
Ready to use with C4's and C8's
Two Color Beige-Brown Case
Size 7"D x 5"W x 2 1/2"H
Documentation

OPTIONS

Adapter cable kit for
10 minute INSTALLATION — \$4.95
SPECIFY

Superboard
C2-4P

C1
C2-8P

WE PAY SHIPPING TO CONTINENTAL U.S.
TEXAS RESIDENTS ADD 5%
ORDER DIRECT OR ASK YOUR OSI DEALER
FOREIGN ORDERS ADD 30%

✓ 326



MICRO
SYSTEMS
CORPORATION

713-846-8268
3909 OLD COLLEGE ROAD
BRYAN, TEXAS 77801



OSI

Video Games I \$15

Head-On, Tank Battle,
Trap!

Video Games 2 15

Gremlin Hunt, Indy
5000, Gunfight

Board Games I 15

Cubic, Mini-Gomoku

Dungeon Chase 10

A D&D video game

C1 Shorthand 12

(C2/4/8 ready soon)

For BASIC-in-ROM systems

SEND FOR FREE CATALOG

Orion Software
Associates ✓ 329
147 Main Street
Ossining, NY 10562

My procedure requires reading the data line and checking it for a leading + mark. If it does not have a + mark, it must be a new subject, so the contents of E\$ are examined for the INPUT \$ that is sought. If the \$ is found, then E\$ is printed; otherwise, D\$ is put in E\$ and a new D\$ is read and examined for a +. If the + is present, it is removed and the rest of D\$ is concatenated to E\$. The next data line is then read into D\$ and examined.

At this point the cycle repeats itself until it encounters a final DONE, then control transfers back and another INPUT word is called for. Note that a space should directly follow the + mark. No commas or colons are allowed in the data statements.

In its simplest form the program requires the user to read the data from the CRT and then press RETURN. This often leaves the operator sitting while the Sorcerer processes the data, so I added an array. Now while the user reads the data brought up on the tube, Sorcerer loads arrays so the user can instantly fill the tube with more data when he presses RETURN. This is a patience-saving addition to the basic plan.

This program overcomes Sorcerer's filing weakness and opens the way for storing and recalling endless amounts of DATA, limited only by available memory. ■

SUPERIOR SOFTWARE PACKAGES FOR THE TRS-80* DISK BASED SMARTTERM •\$79.95

UNQUESTIONABLY THE BEST
SMART TERMINAL PACKAGE
FOR THE TRS-80

- True Break Key
- Auto Repeat (Typomatic) keys
- Programmable 'soft' keys
- Forward/Reverse Scrolling
Multipage Display
- Transmit from Disk File, Screen
or Buffer
- Receive to Disk File, Buffer or printer
- Multi Protocol Capability

SPOOL-80 • \$39.95

A TRUE DISK-TO-PRINT DESPOOLER
FOR THE TRS-80

- Print Disk Files While Running
Other Programs
- Prints Compressed Basic Files
- Includes RS-232 Driver for
Serial Printers

CALL US FOR YOUR CUSTOM
SOFTWARE REQUIREMENTS ✓ 253

MICRON, INC.

10045 Waterford Drive
Ellicott City, MD 21043
(301) 461-2721

Model II
Versions
Available
Soon

*TRS-80 is a Trademark of Tandy Corp.

TRS-80 from MODEL II 99.00 AND CP/M SYSTEM

CP/M 250.00
CBASIC-2 100.00

OSBORNE & ASSOCIATES

GENERAL LEDGER 125.00
PAYROLL 125.00
ACCTS REC & PAY 125.00
MANUALS @ 20.00

NO LICENSE

READY TO RUN RIGHT NOW
Model I Also Available

CPA CLIENT WRITE UP
\$650.00*
FSORT — FAST ASM DISK
SORT \$99.00*

CUSTOM INVENTORY CALL FOR QUOTE

FULL SERVICE ACCOUNTING & PROCESSING ✓ 327 703-573-7300

5423 Crows Nest Court
Fairfax, Virginia 22042

*Licenses Required

MC
VISA



HERE'S HOW! 1. Input data to secretary
2. Into computer 3. Printout back to me.
PRESTO! Subdivision calcs in 1/2 the time
of a programmable calculator.

OUR MICROCOMPUTER SOFTWARE DOES:

- TRAVERSE GEOMETRY
- COORDINATE GEOMETRY
- PROFILE GRADES
- RADIAL STAKEOUT
- CIRCULAR CURVE GEOMETRY
- CIRCULAR CURVE STAKEOUT

DEVELOPED AND SUPPORTED BY ANDREW
MACHEN REGISTERED CIVIL ENGINEER

Complete Program Package
With Instruction Manual **\$260**

MICRO SOFTWARE SYSTEMS
CIVIL ENGINEERING COMP ✓ 151

Call or write for FREE INFORMATION PACKET (714) 755-4033
143c So. CEDROS, SOLANA BEACH CA. 92075

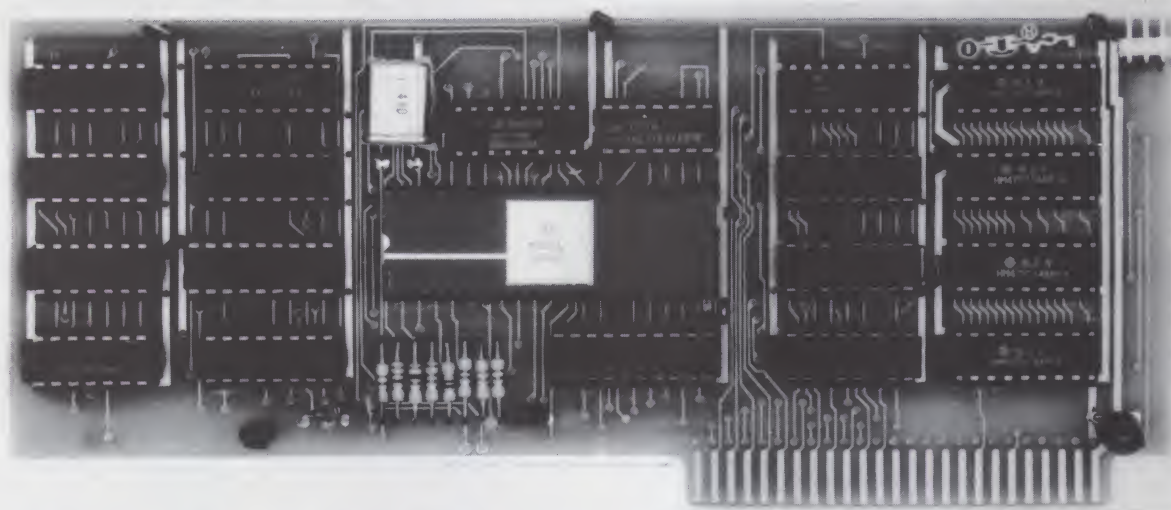


apple® computer



apple® computer

DOUBLEVISION™



80_{COLUMNS} x 24_{LINES} Video Display with Upper and Lower Case

- Works with Apple II*, Apple II Plus*, and PASCAL
- Full 96 ASCII character set
- Fully programmable cursor:
 - 1-9 lines any position
 - Blinking (2 speeds) and non-blinking
- All software included for BASIC (optional for PASCAL)
 - Compatible with the latest in word processing software "Apple-Pie 2.0"
- Shift Lock Feature
- Built in Light Pen capability
- Inverse video
- Full cursor control
- 50/60 Hz operation
- No conflict with other boards

Available now for..... **\$295⁰⁰**

► PASCAL software interface available for \$25.00 additional
 Allow up to 4 weeks for shipment.
 All Mail orders add \$3.00 for postage, insurance and handling

Calif. Residents add 6% Sales Tax

* Apple is a Registered TM of Apple Computers, Inc.

✓ 283

The Computer Stop
 16919 Hawthorne Blvd.
 Lawndale, CA 90260
 (213) 371-4010

MON. - SAT.

10-6

A "Personable" Calendar

Lists, lists, lists! Let PET clear the clutter and confusion.

G. R. Boynton, Chairman
Dept. of Political Science
University of Iowa
Iowa City, IA 52242

I work best off lists. So when time becomes tight, as it frequently does, I start producing lists. My desk calendar serves as one list, and there are usually several pads scattered around that have lists on them. And in the office I am using this year, there is an entire "green" board that I use for making lists.

This proliferation of lists not only produces clutter, but it also eventually leads to confusion. I often cannot find the right list.

So when my PET arrived a few months ago, I knew that

one of the first things it would have to do was help me consolidate my lists. The result is this program, which I call a calendar. It stays in the computer whenever I am not using the PET for some other purpose, and it keeps me informed about what I am supposed to be doing and when.

Introduction

Before I describe the program and its operation, there are two things that need to be said. First, since this is a rather long program, the only way I could approach programming was to break it up into manageable pieces and write them one at a time. So the program is built out of 12 blocks, many of which are subroutines and subroutines within subroutines. Each sec-

tion of the program is short—ten to 20 lines—and each was, thus, easy to write and, I hope, easy to understand. But the best way to understand this program is not to start at the first line and read through the last line.

Second, I call this program a "personable" calendar. I have used many programs for machines ranging from university-owned IBMs and CDCs to the PET. The programs were all designed to be used by the impersonal other.

This program is designed to be used by a human being—me. Several of my biases about what interacting with a computer ought to be like are built into this program; I had to leave out a number of biases to keep the program within 7167 bytes and still have it perform its tasks. I am a person who wants to be recognized. I speak English and would like to interact with my computer more or less in English. I am not interested in interacting in the mode of Y, N, 1, 2, etc., even if it would save a little time.

As I go through the description of the program, I will show how it can be personalized for another human being—you. But if you are the kind of person who is in a hurry with computers, you probably will not like

the "frills" associated with this program. If so, just cut them out. At the end of the article I will summarize some of the "personable" features in this program that I would like to see in other programs.

Program Description

The program is built out of twelve blocks of code. The list with line numbers is shown in Table 1. This list is repeated in lines 900-968 of the program listing. I fiddle with my programs, and I need to know what is where. REM statements may be good for some things, but they are not good for that. They are usually dispersed through the program, and they are not executable.

After this program is loaded it will describe itself if you type RUN 900 or if you type PROGRAM when the program asks "What's next?" This is a particularly valuable feature to build in as you are writing a program. Whenever you want to check some other part of the program, you just type RUN 900, and this directory tells you what line numbers to list.

The first three sections of the program are all designed to say hello. The program begins by asking the user to type hello. Then lines 30, 40 and 50 look for my name in the response. If I

1. Control for hello	(lines 10-120)
2. Greetings Bob	(lines 1000-1099)
3. Greetings other	(lines 1100-1199)
4. Read data for calendar	(lines 2000-2140)
5. Route for calendar subroutines	(lines 2145-2299)
6. Today's events	(lines 2300-2330)
7. Other dates	(lines 2400-2450)
8. Unfinished items	(lines 2500-2599)
9. Change status of item	(lines 2600-2699)
10. Add item to calendar	(lines 2700-2799)
11. Write to tape	(lines 2800-2898)
12. Search by date	(lines 2900-2999)

Table 1. Program description

am in a good mood I sometimes type: "Good morning Isaac; this is Bob." And if I am not in a good mood, I may be a little more tart.

If Isaac (my computer is named after Isaac Asimov, who practically invented the mobile computer) finds my name, then I am routed to lines 1010-1070, which produce a greeting from Isaac. It will not do for the program to be looking for my name on your computer. Just replace my name with your name in lines 40 and 60, and it will look for your name.

I wrote lines 1010-1070 because I got bored with looking at the same greeting every time I used the program. So line 1010 generates a number between 1 and 4. Then line 1020 uses this number to route to one of four greetings. You can change these greetings to make them consistent with the style of your computer. Then line 1025 pauses for a few seconds, and line 1030 returns you to the main routine.

The second part of the greeting can be used to amaze one's family and friends. If the operator just types hello, as instructed, he or she will learn the name of the computer; you will, no doubt, want to change the name in line 70. The operator is also asked his or her name and is then given a brief description of the program in lines 1110-1180. It does not get used very often on my computer, but it does surprise people who have not been around this type of computer.

The program asks for the date, and then routes to the calendar part of the program. The program stores the list of calendar activities on a tape, and lines 2010-2140 read this tape. Lines 2010-2040 remind the user that the tape on which the program is stored must be taken out of the cassette and the data tape put in. Since it is a reminder, any answer to the question other than "no" will let you proceed.

Lines 2050 through 2140 do the actual reading. The first piece of information read is N, which is the number of items on the tape. N is used to define J in

line 2080, and J is used in line 2090 to set the size of the three arrays that are used for storing data. The arrays are set larger than the data to be read so there will be room for making additions later in the program.

The section of the program in lines 2150-2295 asks if you want to see a list of today's activities. Then, beginning in line 2190, it routes you through the search and write routines, which make up the rest of the program. Lines 2190-2255 display the options. The user responds by typing the first word for the appropriate option. If you want

Past items not completed then you type

Past

I thought of a number of ways to assist the uninformed user about which options would not be executed for the informed user, but I finally decided that it was not worth the extra lines of program. So you just have to know to type the first word. Lines 2260 through 2285 convert the English into numbers, which are then used in line 2290 to route the program to the appropriate subroutine.

Each entry in the calendar is called an item. There are three routines for searching the calendar. There are also two routines for changing the calendar. The best introduction to these five routines is ADDITIONS.

With ADDITIONS, you are able to add items to your calendar. It asks for three pieces of information. It asks for the item's date, which includes an item number so that items for the same date can be distinguished. If there are already two activities to be done on November 1, then the date will look like

Nov 01 03

This is the third item for November 1. Then it asks what is the item to be entered. Any message to yourself no longer than two lines will do. Finally, it asks about the status: finished or unfinished?

It is very unlikely that you will be able to remember how many items there are on the calendar for a given day, so lines

2705-2730 let you look at what is already on for that day if you do not remember. Then you input DA\$(N+1) in line 2735. DA\$

stores, and (N+1) puts the new date in the right place in the array. In line 2740 you input

Personable calendar program.

```

1 REM
10 PRINT "PLEASE TYPE HELLO"
20 PRINT "INPUT G$:"
30 FOR I=1 TO LEN(G$)
40 IF MID$(G$,I,LEN("BOB"))="BOB" THEN
  NA$="BOB"
50 NEXT I
60 IF NA$="BOB" THEN GOTO 1010
70 PRINT "MY NAME IS ISAAC. WHAT IS YOUR NAME?"
80 PRINT "INPUT NA$:"
90 GOSUB 1110
100 PRINT "WHAT IS THE DATE TODAY?"
110 PRINT "INPUT D$:"
120 GOTO 2010
900 PRINT "THE PROGRAM IS MADE UP OF THE FOLLOWING:"
902 PRINT "COMPONENTS:"
904 PRINT "1. CONTROL FOR HELLO"
906 PRINT "2. 1010-1200"
908 PRINT "3. GREETINGS BOB"
910 PRINT "4. 1000-1099"
912 PRINT "5. GREETINGS OTHER"
914 PRINT "6. 1100-1199"
916 PRINT "7. READ DATA FOR CALENDAR"
918 PRINT "8. 2000-2140"
920 PRINT "9. ROUTE FOR CALENDAR SUBROUTINE"
522 PRINT "2145-2299"
524 PRINT "2300-2330"
526 PRINT "2330-2330"
528 PRINT "2330-2330"
530 GET A$:IF A$="" THEN 930
532 PRINT "2330-2330"
534 PRINT "2330-2330"
536 PRINT "2330-2330"
538 PRINT "2330-2330"
540 PRINT "2330-2330"
542 PRINT "2330-2330"
544 PRINT "2330-2330"
546 PRINT "2330-2330"
548 PRINT "2330-2330"
550 PRINT "2330-2330"
552 PRINT "2330-2330"
554 PRINT "2330-2330"
556 PRINT "2330-2330"
558 PRINT "2330-2330"
560 PRINT "2330-2330"
562 PRINT "2330-2330"
564 PRINT "2330-2330"
566 PRINT "2330-2330"
568 PRINT "2330-2330"
570 GET A$:IF A$="" THEN 970
572 RETURN
574 IF FRE(0)>200 GOTO 987
576 PRINT "THERE IS VERY LITTLE SPACE LEFT IN"
578 PRINT "MEMORY:"
580 PRINT "DO YOU WANT TO DELETE ALL OF THE ITEMS THAT ARE FINISHED?"
582 PRINT "INPUT A$:"
584 IF A$="YES" THEN E=1:GOSUB 2510
586 GOTO 996
588 IF CH<WR THEN 996
590 PRINT "THERE ARE ONE OR MORE CHANGES THAT HAVE NOT BEEN RECORDED."
592 PRINT "DO YOU WANT TO WRITE THEM TO TAPE?":PRINT:INPUT A$
594 IF A$="YES" THEN GOSUB 2810
596 PRINT "GOODBYE":NA$
598 PRINT "GLAD I COULD HELP YOU."
599 END
1000 REM HELLO BOB
1010 LET N=INT((RND(1)*10)/2.5)+1
1020 ON N GOSUB 1040,1050,1060,1070
1025 FOR K=1 TO 1500:NEXT K
1030 GOTO 100
1040 PRINT "HELLO DESIGNER":RETURN
1050 PRINT "HI, BOB":RETURN
1060 PRINT "BACK TO WORK, EH?":RETURN
1070 PRINT "HOWDY, BOB":RETURN
1100 REM HELLO OTHER
1110 PRINT "BOB";NA$;" I AM A CALENDAR OF THINGS"
1120 PRINT "TO BE DONE."
1130 PRINT "I HELP BOB KEEP UP WITH HIS WORK."
1135 FOR K=1 TO 1500:NEXT
1140 PRINT "HE TELLS ME WHAT HE HAS TO DO ON EACH"
1150 PRINT "DAY, AND I REMIND HIM ABOUT WHAT IS ON"
1160 PRINT "FOR TODAY, AND WHAT HE HAS NOT FINISHED."
1170 FOR K=1 TO 6500:NEXT
1180 RETURN
2000 REM CALENDAR ROUTING
2010 PRINT "FIRST I HAVE TO READ THE TAPE"
2020 PRINT "IS IT MOUNTED AND REWOUND?"
2030 PRINT "INPUT A$:"
2040 IF A$="NO" THEN PRINT "NOTHING HAPPENS WITHOUT READING THE TAPE":GOTO 2020
2050 L=1:D=1:C=0:F$="DCALENDAR"
2060 OPEN L,D,C,F$
2070 INPUT#L,N
2080 J=N+10
2090 DIM DA$(J),IT$(J),ST$(J)
2100 FOR K=1 TO N
2110 INPUT#L,DA$(K),IT$(K),ST$(K)
2120 NEXT K
2130 CLOSE L
2145 REM ROUTE FOR CALENDAR
2150 PRINT "WOULD YOU LIKE TO SEE WHAT IS ON FOR"
2160 PRINT "TODAY?"
2170 PRINT "INPUT A$:"
2180 IF A$="YES" THEN GOSUB 2310
2190 PRINT "WHAT'S NEXT, NA$?"
2200 PRINT TAB(3);"OTHER DATES"

```



```

2210 PRINTTAB(3)"PAST ITEMS NOT COMPLETED"
2220 PRINTTAB(3)"STATUS UPDATE"
2230 PRINTTAB(3)"ADDITIONS"
2240 PRINTTAB(3)"TODAY"
2250 PRINTTAB(3)"DONE WITH CALENDAR"
2260 PRINT"0":INPUT A$
2270 IF A$="OTHER" THEN RO=1
2280 IF A$="PAST" THEN RO=2
2290 IF A$="STATUS" THEN RO=3
2300 IF A$="ADDITIONS" THEN RO=4
2310 IF A$="TODAY" THEN RO=5
2320 IF A$="PROGRAM" THEN RO=6
2330 IF A$="DONE" THEN RO=990
2340 ON RO GOSUB 2410,2510,2605,2705,23
1000 GOTO 2190
2350 REM TODAY
2360 LET SE$=D$
2370 GOSUB 2900
2380 RETURN
2390 REM OTHER DATE
2400 PRINT"WHICH DATE ARE YOU LOOKING
FOR?"
2410 PRINT"0":INPUT DB$
2420 LET SE$=DB$
2430 GOSUB 2900
2440 RETURN
2450 REM STATUS UNFINISHED
2460 PRINT"WHERE IS WHAT IS HANGING O
YOUR HEAD?"
2470 FOR K=1 TO N
2480 IF E=1 AND ST$(K)="NOT FINISHED" T
HEIN NN=NN+1
2490 IF ST$(K)="NOT FINISHED" THEN 2560
2500 NEXT K
2510 IF E=1 THEN 2810
2520 RETURN
2530 PRINT"0":DA$(K)
2540 PRINT IT$(K)
2550 FOR Z=1 TO 1500:NEXT Z
2560 GOTO 2540
2570 REM CHANGE STATUS
2580 PRINT"WHAT IS THE DATE OF THE IT
EM YOU WANT?"
2590 PRINT"0":INPUT DB$
2600 PRINT"DO YOU WANT TO LOOK AT THE
ITEMS FOR?"
2610 PRINT"0":THAT DATE FIRST?"
2620 PRINT"0":INPUT A$
2630 IF A$="YES" THEN GOSUB 2430
2640 PRINT"WHAT IS THE DATE AND ITEM N
UMBER?"
2650 PRINT"0":INPUT DI$
2660 PRINT"IS THE NEW STATUS TO BE 'FI
NISHED', OR"
2670 PRINT"NOT FINISHED'?"
2680 PRINT"0":INPUT ST$
2690 FOR K=1 TO N
2700 IF DI$=DA$(K) THEN ST$(K)=ST$
2710 NEXT K
2720 CH=CH+1:PRINT"OKAY THE CHANGE IS
MADE. DO YOU WANT TO MAKE ANOTHER CHANGE?"
2730 PRINT"0":INPUT A$
2740 IF A$="YES" THEN 2605
2750 RETURN
2760 REM ADDITIONS
2770 PRINT"WHAT IS THE DATE OF THE NEW
ENTRY?"
2780 PRINT"0":INPUT DB$
2790 PRINT"0":SINCE YOU HAVE TO GIVE AN I
TEM NUMBER"
2800 PRINT"AS WELL AS THE DATE DO YOU W
ANT TO LOOK AT THE ITEMS FOR THAT DATE?"
2810 PRINT"0":INPUT A$
2820 IF A$="YES" THEN GOSUB 2430
2830 PRINT"WHAT IS THE DATE AND ITEM N
UMBER?"
2840 PRINT"0":DA$(N+1)
2850 PRINT"WHAT IS THE ITEM TO BE ENTE
RED?"
2860 INPUT IT$(N+1)
2870 PRINT"WHAT IS THE STATUS: FINISHE
D OR NOT"
2880 PRINT"0":FINISHED?":INPUT ST$(N+1)
2890 N=N+1:CH=CH+1
2900 PRINT"DO YOU WANT TO ADD ANOTHER
ITEM?"
2910 INPUT A$
2920 IF A$="YES" THEN 2705
2930 PRINT"ARE YOU READY TO WRITE ALL
ON THIS ON THE TAPE?"
2940 INPUT A$:IF A$="YES" THEN GOSUB 28
10
2950 RETURN
2960 REM WRITE TO TAPE
2970 L=1:D=1:C=1:F$="DCALENDAR"
2980 OPEN L,D,C,F$
2990 IF E=1 THEN PRINT#L,NN:GOTO 2840
3000 PRINT#L,N
3010 FOR K=1 TO N
3020 IF E=1 AND ST$(K)="FINISHED" THEN
3030 GOSUB 3000
3040 PRINT#L,DA$(K)
3050 PRINT#L,IT$(K)
3060 PRINT#L,ST$(K)
3070 NEXT K
3080 CLOSE L:WR=WR+1:CH=WR
3090 RETURN
3100 REM SEARCH FOR DATE AND PRINT
3110 CO=0
3120 LET W=LEN(SE$)
3130 FOR K=1 TO N
3140 IF LEFT$(DA$(K),W)=SE$ THEN 2960
3150 NEXT K
3160 IF CO=0 THEN PRINT"NOTHING FOR ";
3170 RETURN
3180 IF CO>0 THEN 2970
3190 PRINT"0":THE ITEMS ON THE CALEND
AR ARE:
3200 PRINTTAB(3)DA$(K)
3210 PRINTTAB(3)IT$(K)
3220 PRINTTAB(3)ST$(K)
3230 LET CO=CO+1
3240 FOR Z=1 TO 1500:NEXT Z
3250 PRINT"0":GOTO 2930
3260 POKE59411,53:POKE 514,0:WAIT 514,1
3270 POKE 59411,61:RETURN

```

IT\$(N+1). IT\$ is the array that holds the items, and (N+1) puts the new item in the correct location in the array. Finally, you enter the status of the item, whether it is finished or not, in line 2745 as ST\$(N+1).

In line 2750 the program updates N so that the correct number of items will be written on the tape. It also updates a variable CH, which counts the changes you make. Then you are asked if you want to add another item, and if you do you cycle through the whole thing again.

When you have finished adding items, you are asked if you want to write the items on tape. It is possible to write the data to tape either at this point or later when you are finished with the program.

There is one very satisfying thing about making lists: crossing all of those items off the list. STATUS is not quite as good as a heavy swipe across the page, but this routine, in lines 2605-2695, does let you do something rather like that. You can type "finished," a satisfying experience. It also is very useful in that it permits the operation of one of the search routines.

STATUS first asks for the date of the item to be changed. Since the user is not likely to remember the item number, you are given the option of looking at the items for the date. Then the user is asked to specify whether the new status is to become "finished" or "not finished." The loop in lines 2665-2675 searches the array in which the dates are stored to find the date specified, and when that date is found, it changes the value to the status array. Notice that the CH variable is also updated in this routine as it was in ADDITIONS.

Two search routines, TODAY and OTHER, operate in a similar way. TODAY converts the date entered at the beginning of the program to SE\$, and then it goes to the subroutine beginning at line 2900. OTHER asks which date you would like to find, converts the answer to SE\$, and then goes to the same subroutine. The search is done

by the loop in lines 2910-2930. Statements 2905 and 2920 let you search for any part of the date. If you know that something is supposed to happen in April, but you do not remember the day, you can search for all entries in April by simply typing April, or its abbreviation, in answer to the question asking for the date to be found. If you know the exact date, April 28, for example, then you can search for that specific date. This feature also lets you abbreviate the month in any way you wish as long as you are consistent.

There is one slightly inconvenient side effect of this procedure for searching. If you ask for April 2, the search routine will not distinguish April 2 from April 22 or April 28. Thus, you need to use 01, 02 and 03 for indicating the first, second and third day of each month.

PAST is the routine that searches for unfinished items. Here is what is hanging over your head, as it says. Since this list may get long (at least mine does), there is a pause built in by line 2580 so that the whole list does not go scrolling off the screen faster than you can read it.

The routine that writes the data to the tape is in lines 2800-2899, and when combined with lines 980 through 990, these lines provide two special services for the user. After adding items to the calendar, the user can write these items to the data tape. In addition, when you are finished with the program, which is signified by typing "done," the program makes two checks.

The three arrays grow as the number of items added to the calendar increases. This means that the amount of memory used also increases. Line 980 checks to see if there are at least 200 bytes of memory left.

When there is less than this amount of memory, the program asks the user if he or she wants the program to write the tape deleting all of the finished items. If the answer is yes, line 985 sets the variable E to 1 and goes to the PAST routine. It lists all of the items that are un-

finished and counts them. Then it goes to the write routine, and the tape is written without the finished items, which should substantially reduce the memory used.

There is a funny-looking subroutine in line 3000 that needs to be explained. There is a glitch in the writing routines in the PET that does not usually pose a problem. But when writing some items and not writing others, this glitch produces funny (undesirable) results. Line 3000 is one "fix." It turns the tape drive motor off, waits for 16 jiffies and then turns the motor back on. It is needed to make sure your tape is copied accurately.

Lines 987-990 check to make sure that no changes not written on the tape have been made. In line 987 the program compares the values of CH and WR. If CH is less than or equal to WR, then any change that has been made has been put on the tape. If CH is greater than WR, the program asks the user if he or she wishes to add these changes to the tape. Even if you or I forget to rewrite the tape, the program will remind us that it needs to be done.

This program carries the user very naturally through its operation. There is, however, one feature that requires instruction. The first time the program is run, there is no data tape. If you start at the beginning of the program, it will ask you for a data tape that does not yet exist.

The solution to this apparent quandary is to run the program the first time with the command RUN 2190. This will ask "What's next?" and give a list of options. Use the ADDITIONS routine to enter several items for the calendar. Then when the program asks if you want to write these to tape, insert a new tape into the cassette, and you have a data tape. Henceforth you will be able to start at the beginning of the program.

Personable Qualities

There are four features of this program that make it a "personable" calendar. The first is variety. There is no

reason why every statement by the computer or the user needs to be the same every time the statement is made. Isaac can say "hello" in four different ways. There is no reason that this strategy could not be used to take boredom out of the repetitious tasks.

Also, Isaac can look for and find my name no matter what sentence I embed it in. One version of this program had a subroutine that let the user say "yes" in any of five ways. There is little reason for the interaction of computer and human being to be stilted; at least not when a moderate amount of imagination is exercised.

Second, the program is self-describing. Type RUN 900 or ask for program, and the program describes itself. REMark statements are useful if the program is written on a piece of paper. But if the program is too large to fit on the screen for a single viewing, they are likely to be hard for the user to find.

Third, programs that learn can be written. Learning in the sense of accumulating, storing and using information is quite easy to build into programs. This program learns how many items there are on the data file, how many changes have been made and whether they have all been written on the tape, and whether it is approaching the bounds of memory. Short game programs that are likely to be played repetitively or teaching programs can easily be written so that they learn about the skill of the user as he or she plays the game.

Finally, the computer ought to be programmed to do as much of the work as possible. This program keeps track of two important aspects of its operation: changes and core availability. Then the user does not have to do this work with the consequent problems it entails.

For "personal" computers it would be nice to have "personable" computer programs.

There is one nice thing about finishing this article: now I can type "finished" by an item that has been hanging over my head for more than a month. ■

MULLEN Computer Products

H8

PROTOTYPE BOARD

Now available for the Heathkit H8 hobbyist.

- Full-sized FR-4 board with heat sink/mounting brackets, buss connectors and polarizing key
- Designed for ease of external cable connection
- All plated thru holes .042" on .1" centers, power and ground traces

HKB-1 H8 PROTOTYPE BOARD \$46. Kit



H8 EXTENDER BOARD

Our HTB-0 lets H8 owners troubleshoot their boards faster and easier. Each board can be extended above the computer for complete access to all circuits and components.

FEATURES

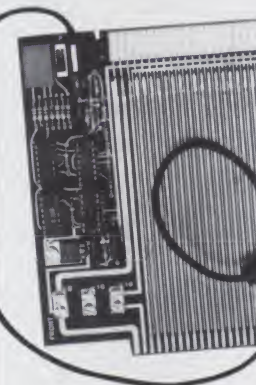
- Sturdy 3/32" board
- Molex 25-pin edge connectors with formed leads for easy scope probe attachment
- Jumper links in power lines makes current measurement and fusing easy

HTB-0 H8 EXTENDER \$39. (Kit only)

Up-Date

MULLEN Computer Products

S-100 EXTENDER/LOGIC PROBE



- New interlaced ground and signal traces, improves performance, reduces noise, with the new high clock frequency boards
- New brighter display, makes this very handy logic probe easier to use
- New proposed IEEE buss edge connector label, with all the fine quality documentation you expect with Mullen kits.
- High quality FR-4 board is double sided with plated thru holes and solder-masked for easy kit assembly
- Gold on all mating connector surfaces for better electrical contact
- Formed connector leads for easy scope probe attachment
- Jumper links in power lines makes current measurement and fusing easy
- Large "kluge" area lets you build and test your own circuits

S-100 EXTENDER/LOGIC PROBE \$50. Kit \$79. Assem./tested

S-100 CONTROLLER BOARD

8 relay - OUTPUTS

8 opto-isolator - INPUTS

256 switch selectable addresses

Our S-100 CONTROLLER is used in laboratories, at universities, and in industry, in hundreds of applications, and may be the answer to your control problem. Complete programming and operating instructions included.

For higher power applications a 500W AC POWER MODULE is available for \$15.

CB-1 CONTROLLER Kit \$129. Assem./tested \$179.

MULLEN Computer Products

NEW TRS-80* CONTROL BOX

ASSEMBLED BURNED-IN & TESTED, READY TO USE

Special introductory price
M-80 OCTOPORT
\$159. Assem./Tested

- 8 reed relay - OUTPUTS
- 8 opto-isolated - INPUTS
- Selectable port address
- Power supply
- Assembled cable & connectors



Use your TRS-80, and our M-80 control box to program control energy savings devices at home or in your business. Send for our free application notes today.

*TRS-80 is a trademark of Tandy Radio Shack Corp.

PLEASE ORDER KITS BY NAME (H8 OR S-100). SEND TO:
MULLEN COMPUTER PRODUCTS, BOX 6214, HAYWARD, CA 94544
OR PHONE (415) 783-2866. VISA/MASTERCARD ACCEPTED.
INCLUDE \$1.50 FOR SHIPPING & HANDLING. CALIFORNIA RESIDENTS ADD TAX.

37

Order Direct or Contact your Local Computer Store.

MAYDAY™

The Complete Uninterruptable Power Supply



The lights blinked -
even the slightest power failure

can ruin a data disk and
cause loss of the program.

Protect your time and
investment -

easy to use -
just plug your computer into
MAYDAY.™



for more information contact ...

Sun - Technology, Inc.

Box 210

New Durham, New Hampshire 03855

(603) 859-7110

✓ 152

We honor:



(Manufacturing high technology products since 1970)

PROFESSIONAL

TRS-80 Business Software from 49⁰⁰

TRS-80 MODEL II

All of our Model II Software Requires CP/M and CBASIC. This allows you to take full advantage of your Model II.

CP/M \$250

CBASIC \$100

OSBORNE WITH OUR ENHANCEMENTS

GENERAL LEDGER \$125.00

Handles up to 8000 transactions to as many as 750 operator defined accounts. Formal report formatting at report print time. It stores a full years of posting by Month, Year and Quarter. Handles Departmentalization. Integrates with Accounts Receivable and Accounts Payable.

PAYROLL \$125.00

Computes pay, Taxes, Handles Multiple Pay Types, keeps Employee Records, handles Multiple Reoccurring Deductions, Prints Checks, Prints Payroll Journal, W-2s, 941a, Complete Job Cost with Overhead Distribution.

ACCTS REC & PAY \$125.00

Accounts Payable has complete Purchases Journal which creates Purchase Orders that post to Payables when goods are received. Calculates checks by due date or by demand, Aged Ledger Accounts Receivable has a complete Sales Ledger and handles open items with Balance Forward type payments allowed. Gives true aging plus more.

OUR PROGRAMS

INVENTORY \$350.00

CPA CLIENT WRITE UP \$650.00

TRS-80 MODEL I

All these programs run with TRSDOS and Radio Shacks Level II Disk Basic.

Osborne

General Ledger, Payroll, Accts Rec & Payable. Each \$49.00 or \$129.00 for all three.

Manuals for the Osborne programs and ours \$20 each

These programs are already running and can be working for you now. Just call or write and we will answer your questions as to how it can work for you.

Full Service Accounting & Processing

5423 Crows Nest, Fairfax, Va. 22030
VISA/MASTER CHARGE

(703) 573-7300 ✓ 131

NEW!!
MODEL II

RM Cobol with Multi Key ISAM
\$ 495.00 Manual \$ 39.00

We deduct 2.00 from phone orders
to cover your call for you!

NEW! Produced in U.K. and widely used in England and USA COMPLETE BUSINESS PACKAGE

INCLUDES EVERYTHING FROM INVENTORY TO
SALES SUMMARY. PROMPTS USER AND VALIDATES ENTRIES.
MENU DRIVEN

BUS VER 3.00 to VER 9.00 PET and CP/M.

Approximately 60-100 entries/input require 2-4 hours weekly and entire business is under control

- * PROGRAMS ARE INTEGRATED.....
- 01 = *ENTER NAMES & ADDRESSES.....
- 02 = *ENTER/PRINT INVOICES.....
- 03 = *ENTER PURCHASES.....
- 04 = *ENTER A/C RECEIVABLES.....
- 05 = *ENTER A/C PAYABLES.....
- 06 = *ENTER/UPDATE INVENTORY.....
- 07 = *ENTER/UPDATE ORDERS.....
- 08 = *ENTER/UPDATE BANKS.....
- 09 = *EXAMINE/REPORT SALES LEDGER.....
- 10 = *EXAMINE/REPORT PURCHASE LEDGER.....
- 11 = *MONITOR INCOMPLETE RECORDS.....
- 12 = *EXAMINE PRODUCT SALES.....

.....ENTER WHICH ONE ?

- SELECT FUNCTION BY NUMBER.....
- 13 = *PRINT CUSTOMERS STATEMENTS.....
- 14 = *PRINT SUPPLIERS STATEMENTS.....
- 15 = *PRINT AGENT STATEMENTS.....
- 16 = *PRINT TAX STATEMENTS.....
- 17 = GENERAL HELP.....
- 18 = ALTER VOCABULARIES.....
- 19 = PRINT YEAR AUDIT.....
- 20 = PRINT PROFIT/LOSS A/C.....
- 21 = ENDMONTH MAINTENANCE.....
- 22 = PRINT CASHFLOW FORECAST.....
- 23 = ENTER PAYROLL NO RELEASE.....
- 24 = EXIT SYSTEM.....

DATABASE MANAGEMENT INCLUDES

*** FILE CREATE/DELETE/SEARCH. *** RECORD CREATE/DELETE/SEARCH/4 OPTION PRINT. *** RECORD SORT ANY FIELD ALPHA OR NUMERIC. *** INDEX SEARCH OR GENERAL SCAN/PRINT IN ANY FIELD (EG TOWN OR NAME). *** 4 ARITHMETIC FUNCTIONS TO USE AS CALCULATOR ON LAST 4 FIELDS. *** AUTO CHECK TO PREVENT DOUBLE ENTRY TO FILE MANAGEMENT SYSTEM, DYNAMICALLY ALLOCATING INFORMATION TO MINIMIZE DISK SPACE CONSUMPTION

VERY FLEXIBLE—EASY TO USE

G.W. COMPUTERS U.K. ARE THE PRODUCERS OF THIS BEAUTIFUL PACKAGE

VER 3.00 (EXC PROG 19,20,22,23) = 475.00, VER 4.00 INCLUDES AUTO STOCK-UPDATE = 575.00, VER 5.00 INCLUDES AUTO BANK UPDATE = 675.00, VER 6.00 IN CORE = 775.00, VER 7.00 (INC 19,20,22,23) NOT YET RELEASED = 875.00, VER 8.00 RANDOM ACCESS = 900.00, VER 9.00 TRANSLATEABLE = 975.00

+ + + EACH LEVEL OVERRIDES LOWER ONE

WE EXPORT TO ALL COUNTRIES CALLERS ONLY BY APPOINTMENT CONTACT TONY WINTER ON 01.636.8210
89 Bedford Court Mansions, Bedford Avenue, London W.C.1. ✓75

NOTE!!! All versions, especially 9.00 use broad financial principles and 9.00 is one 16K core program releasing both disk drives for data storage, as well as being translateable into any foreign language.

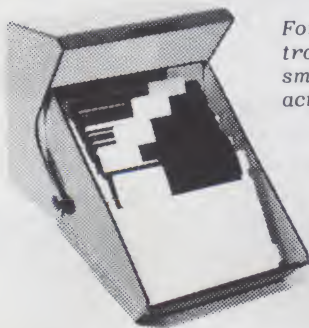
MAGNETIC MEDIA DISTRIBUTORS ✓72

596 Taylor Way Belmont, California 94002 (415) 595-0684

Flip Sort™ DISK STORAGE SYSTEM

Keeps dust
off of disks

Built-in
plastic file
separators



Formed from
transparent
smoke colored
acrylic

50 to 60 Disk
capacity

For Mini-Disks \$34⁹⁵
For 8" Disks \$44⁹⁵

plus \$3.00 shipping for each
Flip Sort™

DEALER INQUIRIES INVITED

FLOPPY DISKS FOR ALL COMPUTERS

5¼" DISKETTES

Diskettes available in Soft Sector, 10 or 16 hole Hard Sector

	1-99	100-UP
Single Side-Single Density (Certified 35 tracks)	\$ 2.85	\$ 2.60
Single Side-Double Density (Certified 40 tracks)	\$ 3.75	\$ 3.55
Double Side-Double Density (Quad Density)	\$ 4.50	\$ 4.30
Single Side-Double Density (Certified 77 tracks)	\$ 4.00	\$ 3.80

8" DISKS

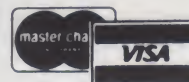
Single Side-Single Density (Soft Sector)	\$ 3.40	\$ 3.20
Single Side-Double Density (Soft Sector)	\$ 4.60	\$ 4.40
Double Side-Single Density (Soft Sector)	\$ 4.95	\$ 4.75
Double Side-Double Density (Soft Sector)	\$ 5.10	\$ 4.90

Single Side-Single Density (Hard Sector 32 hole)	\$ 3.60	\$ 3.40
Single Side-Double Density (Hard Sector 32 hole)	\$ 4.00	\$ 3.80
Single Side-Single Density (Hard Sector 32 hole)	\$ 4.65	\$ 4.50

(MRX 651 compatible OD holes)
We stock VERBATIM, WABASH, KYBE, KEYLINE & ATLANTIS
Disks and Diskettes at LOW, LOW, prices. Write for our mini
catalogue.

VINYL DISK SLEEVES for 5 1/4 and 8" Disks \$ 9.00 10pak
PLASTIC LIBRARY CASES 8" \$ 4.50 5 1/4" \$ 3.50
FLOPPY SAVER (Hub Reinforcing Rings
5 1/4" with applying tool \$ 14.95 pk of 25 Refills \$ 7.95
8" with applying tool \$ 16.95 pk of 25 Refills \$ 8.95

CALL TOLL FREE TO ORDER
800 227-7362
IN CALIFORNIA 415 595-0685



Recover That Lost Disk BASIC Program

A trick for the TRS-80.

Louise H. Frankenberg
1289 Magothy Rd.
Pasadena, MD 21122

If you have ever accidentally been rebooted back to DOS 2.1 while in the middle of key-boarding a long BASIC program, you will be happy to know that the program is still intact in memory and can easily be completely recovered. The following discussion assumes that you originally answered the FILES? question with the default value by merely pressing ENTER.

Storing the Program in Memory

Suppose you have typed in the following BASIC program:

```
1'AAAAA
2'BBBBBB
3'CCCC
```

Under DOS 'DEBUG' this will appear in memory as in Example 1.

The BASIC program always starts at location 68BA and ends after three 00 bytes in a row. The first two bytes of each

BASIC statement contain the LSB and MSB of the starting address of the next statement. In the example, new statements start at 68BA, 68C7 and 68D5. The contents of address 68D5 point to an address containing 00, since that is the end of the program.

The next two bytes of each statement contain the BASIC line number (LSB and MSB). Here they contain 0100, 0200 and 0300. Next we have the BASIC code (3A 93 FB is TRS-80-ese for "remark," 41="A," 42="B" and 43="C"), and then a single 00 byte. The program end address that you'll need to know for program recovery is the address of the byte immediately following the three 00 bytes. In this example it's at 68E3.

Program Recovery

Now that we've seen how the program is stored in memory, here are "cookbook" instructions for recovering your program (values for the example are

in parentheses).

1. Go into the 'DEBUG' program immediately upon finding yourself in DOS.

2. Display the 6800 page and jot down the contents of addresses 68BA and 68BB (C7 and 68); convert to decimal (199 and 104).

3. Page through memory with 'DEBUG' until you find three 00 bytes in a row and jot down the following address (68E3); convert to decimal (LSB E3=227 and MSB 68=104).

4. Enter G5200 to return to BASIC (never use G402D and reload BASIC, or you'll wipe out the start of the program).

5. Answer FILES? and MEMORY SIZE? as originally.

6. Tell the computer what's in the beginning of the program and where to find the end. For the example you would POKE the following:

```
POKE 26810,199 (contents of 68BA)
POKE 26811,104 (contents of 68BB)
POKE 16633,227 (LSB of end address)
POKE 16634,104 (MSB of end address)
```

That's all there is to it! Your program is now ready to run, save on disk, add to or whatever.

Additional Notes and Comments.

I worked out the above the hard way. As a newcomer to disk, I lost hours of program typing in the process. An accidental reboot to DOS when doing

disk I/O can be avoided in the first place by disabling the clock interrupt: either use CMD"T" or use 'DEBUG' to change addresses 46B8-46BF to the following (the latter is Radio Shack's new official patch):

```
CB 57 20 13 FE 20 28 11
```

If you originally answer the FILES? question with something other than the default value, your program will start at a different address (it's at 69DC for FILES?4). Find it with 'DEBUG'.

You can also recover a program that has "disappeared" after entering 'NEW'. In that case you would use CMD"S" to return to DOS, and go into 'DEBUG' as before. Since 'NEW' wipes out the contents of 68BA and 68BB, you will have to find the address where the second BASIC statement starts (68C7, in the example) and jot it down to poke into 68BA and 68BB. All the remaining steps are identical.

One more note: After I wrote this article, Radio Shack released DOS 2.2, which contained the clock-interrupt disable patch. This cured the problem for me. 2.2 appears to contain new bugs for multiple-drive use, but if you have only one disk drive I recommend you pick up your free copy as soon as possible. ■

68B0	FF 00 FF 00 FF 00 FF 00	FF 00 C7 68 01 00 3A 93
68C0	FB 41 41 41 41 41 00 D5	68 02 00 3A 93 FB 42 42
68D0	42 42 42 42 00 E1 68 03	00 3A 93 FB 43 43 43 43
68E0	00 00 00 FF (etc.)	

Example 1.

METAMORPHOSIS!

OLD OR NEW PETS CAN NOW HAVE HIGH RESOLUTION GRAPHICS



Now you can add high resolution graphics to your Commodore PET computer. The MTU K-1008-6 GRAPHIC INTERFACE can be used with either old, new, or business PET computers. It is simple to use, and fits inside the PET for protection.

The GRAPHIC INTERFACE gives you easy control over each dot in a matrix which is 320 wide by 200 high for a total of 64,000 dots. Because each dot can be controlled, either graphic images, text lines, or any mixture of the two can be displayed. Since each dot is controlled from software you can even design your own special character font or graphic image set (logic, chemical, architectural).

INTERFACE TO ALL PETS - With separate connector boards for each style PET (K-1007-2 for OLD PETS, K-1007-3 for NEW). The K-1008-6 can be used with either.

THREE TYPES OF VIDEO - You can select either normal PET video, graphic video, or the COMBINED image of both video signals simultaneously!

8K RAM MEMORY EXPANSION - The graphic matrix requires 8K RAM which is supplied onboard. This memory can be used for program or data storage when not being used for graphics (or see your program in binary on the display!).

FLEXIBLY ADDRESSED ROM SOCKETS - Five ROM sockets are included on the board. They can be set *at the same* or different addresses, with you controlling which sockets are enabled at any time through software control. You also choose the sockets to be enabled when the PET is turned on.

EXTERNAL EXPANSION - This board also creates the KIM memory expansion bus supported by all MTU products. This allows insertion into our K-1005-P card file for expansion up to 4 other boards outside the PET case.

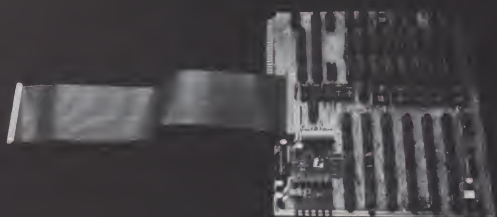
LIGHT PEN - The board has been designed to work with an optional light pen which MTU will be announcing soon.

SOFTWARE INTERFACED TO BASIC - MTU also has available machine language software to allow you to plot points, draw lines, and display characters at high speed.

Call or write for our full line catalog of products.

MICRO TECHNOLOGY UNLIMITED
P.O. Box 12106
2806 Hillsborough Street
Raleigh, N.C. 27605
(919) 833-1458

Reader Service No. 154



CP/M Is for Me

A favorable look at this controversial system.

Ken Barbier
PO Box 1253
Borrego Springs, CA 92004

In "CP/M and You" (*Microcomputing*, February 1980, p. 183) Thom Hogan voiced some complaints about CP/M while making some valid points both for and against the operating system. But the overall picture he painted was a little too gloomy. CP/M is, I think, the second most valuable piece of software for either mini- or full-sized floppy disks, running second only to Microsoft Disk Extended BASIC.

Even with only a single mini-floppy disk drive, the CP/M operating system can provide a comfortable solution to mass storage. But some things are inevitable, so room has been left in the cabinet for a second drive.

I have been running a single-drive CP/M system on 5¼-inch single density disks for a year now and haven't experienced the insufficient disk space that Hogan describes. The secret is to eliminate from your working disks all of the CP/M-supplied transient programs that you won't use in day-to-day operation. See Listing 1 for a record of a session that prepares a "packed" system disk for use in writing assembly-language programs.

Start with a Fresh Copy

A new CP/M user must first write-protect the system disk and make copies of it. You

do this on a single-drive system by using routines supplied with your disk operating system (DOS). Next, you should use MOVCPM and SYSGEN to generate the largest version of the operating system you can fit into your available read-write memory. You then won't need these programs on the disks you will be using daily. Other programs supplied on your system disk can also be eliminated on your working disks. But before you start erasing, make your system back-up copies.

You are now ready to take one of these copies and use it to generate a "packed" system disk. This will take the better part of an hour. Then you can write-protect this disk and make copies of it for your day-to-day use.

Packing a system disk involves more than erasing the unwanted files. This would leave a fragmented disk directory full of small holes where the old programs have been erased. Your new, long files would be broken into little pieces and scattered over the disk to fill all the holes left by erasing the unneeded files. This would cause an unnecessary amount of track-to-track stepping and too much waiting for the next sector to come around.

Why Do You Need to Pack?

Some operating systems for floppy disks will only write contiguous files. In such systems, each file has a starting track and sector and a file length recorded in the directory. On the disk, each sector of the file immediately follows the previous sector, until the complete file is written.

When files are deleted from the directory, that space is not used by the next write operation, because it might not be large enough to permit writing the entire file in one contiguous block. In such a system, periodic packing sessions are required following file erasures or updates. Packing a disk will move all the remaining files down in the disk address space to fill in all the holes.

This system's advantage is that once your disk drive read-write head has found



the first record of a file, it need only read consecutive sectors and tracks until the entire file is in memory. This results in the fastest possible load time. The disadvantage of the system is that in a typical work session involving repeated edit and assembly operations, the disk space will fill up more quickly, and you will have to stop while the system packs the disk.

CP/M Does It Smarter

CP/M uses a different technique, employing a disk map. The entire disk address space (track n, sector m) is mapped in the directory; a block of 1024 (1K) is the minimum size. In the soft and 16-sector formats, each sector contains 128 bytes, so each map entry points to a block of eight sectors. In the North Star ten-sector format, each entry addresses four 256-byte sectors (the double-density scene is even more complicated).

Each map entry points to the track and sector number of the first sector of each block only, so the remaining sectors must immediately follow each other. But this is true only within each 1K block, not the entire file, as was true with the other system.

This mapping means that when we write a long file, CP/M will find the first available 1K block on the disk and fill it, then find the next block and fill it and so on. If we have erased a number of short files—for example, one on track 6, one on track 14 and one on track 23—our long file will be broken up into 1K blocks and stored in all the holes on the disk. Loading a file that has been scatter-written takes considerably longer, and if your drive uses a noisy stepper motor, you can hear the numerous track-to-track seeks. Such drives sound nervous, buzzing from track to track collecting the program.

A disk-mapped operating system's advantage is that the disk takes longer to fill up, since every available block is filled from the bottom of the disk up. A disadvantage, in addition to possible fragmentation, is that no file can be less than 1K. The last block assigned to a file can possibly contain only a single byte, but it still takes up 1K of disk space!

We should not simply erase the unwanted files on our CP/M disk and start using the disk at that point. We should first pack the disk. The session that produced the accompanying listing is not something you would want to endure very often, so go through it only once, and then make copies of the resulting packed system disk for your daily operations.

Start Packing

The listing starts with a dump of the directory of the CP/M for North Star disk as supplied by Lifeboat Associates. In this example, MOVCPM and SYSGEN have been

renamed, since they contain procedures specific to the North Star computer. Assuming we have completed our system generation and CBIOS (Custom BASIC Input-Output System), we are ready to pack.

First, decide what programs you want to save and put them in order according to frequency of use. Since you are going to speed up your disk access by packing a system disk, you might as well have the most-used programs at the start of the disk, where they can be found fastest.

Working in assembly language, you are going to be editing, assembling, debugging, editing, assembling and debugging. Thus,

you want to pack your disk in the following sequence: ED.COM, ASM.COM, DDT.COM. What comes next is pretty much a toss-up. Note that I have erased SUBMIT.COM. You might want to hang on to it, unless you are sure you won't be using it.

You have listed the directory and used STAT to see how much space each file occupies and how much disk space you have left. To pack the disk, you will have to move all the programs you want to save to the top of the disk address space and then clear out the bottom of the disk space to produce one large hole. When you then move the saved programs back down, they will each

```
A>DIR
A: NRELOC    COM
A: STAT      COM
A: PIP        COM
A: SUBMIT     COM
A: ED         COM
A: ASM        COM
A: DDT         COM
A: LOAD       COM
A: NSYSGEN    COM
A: DUMP       COM
A: DUMP       ASM
A: USER      ASM
A>STAT *. *
```

```
RECS BYTS EX D:FILENAME. TYP
64    8K  1 A:ASM.COM
38    5K  1 A:DDT.COM
32    4K  1 A:DUMP.ASM
4     1K  1 A:DUMP.COM
48    6K  1 A:ED.COM
14    2K  1 A:LOAD.COM
78   10K  1 A:NRELOC.COM
8     1K  1 A:NSYSGEN.COM
55    7K  1 A:PIP.COM
24    3K  1 A:STAT.COM
10    2K  1 A:SUBMIT.COM
14    2K  1 A:USER.ASM
BYTES REMAINING ON A: 27K
```

```
A>NOW LET'S SAVE SOME SPACE
NOW?
```

```
A>ERA *. ASM
A>PIP ED. SAV=ED.COM
```

```
A>PIP ASM. SAV=ASM.COM
```

```
A>PIP DDT. SAV=DDT.COM
```

```
A>PIP STAT. SAV=STAT.COM
```

```
A>PIP PIP. SAV=PIP.COM
```

```
A>PIP LOAD. SAV=LOAD.COM
```

```
A>PIP DUMP. SAV=DUMP.COM
```

```
A>STAT
A: R/W. SPACE: 1K
```

```
NOW WE'LL MOVE EVERYONE BACK
NOW?
```

```
A>ERA *. COM
A>REN PIP.COM=PIP.SAV
A>PIP ED.COM=ED.SAV
```

```
A>PIP ASM.COM=ASM.SAV
A>PIP DDT.COM=DDT.SAV
A>PIP STAT.COM=STAT.SAV
A>PIP PIPX.COM=PIP.COM
A>PIP LOAD.COM=LOAD.SAV
A>PIP DUMP.COM=DUMP.SAV

A>ERA *. SAV
A>ERA PIP.COM
A>REN PIP.COM=PIP.X.COM
A>NOW LET'S SEE WHAT WE'VE GOT
NOW?
```

```
A>DIR
A: ED        COM
A: ASM       COM
A: DDT       COM
A: STAT      COM
A: PIP       COM
A: LOAD      COM
A: DUMP      COM
A>STAT *. *
```

```
RECS BYTS EX D:FILENAME. TYP
64    8K  1 A:ASM.COM
38    5K  1 A:DDT.COM
4     1K  1 A:DUMP.COM
48    6K  1 A:ED.COM
14    2K  1 A:LOAD.COM
55    7K  1 A:PIP.COM
24    3K  1 A:STAT.COM
BYTES REMAINING ON A: 46K
```

```
A>NOW PATCH (313E+BIAS) FOR
40 TRACKS NOW?
```

```
(AT THIS POINT THE CONTROL PANEL
IS USED TO START A MONITOR
PROGRAM IN PROM)
```

```
-S713E
713E 4F 5B
713F C0 .
-GA040
```

```
(THE ROUTINE IN PROM AT ADDRESS
A040 WRITES TRACKS 0 - 2 FROM
CP/M IN MEMORY)
```

```
A>NOW HOW MUCH DO WE HAVE?
NOW?
```

```
A>STAT
A: R/W. SPACE: 58K
```

Program listing. Console messages during a mini-disk packing session. Eliminating unneeded files from the CP/M system disk increases the available workspace by 19K. Packing the remaining programs reduces access time. A final system patch permits the use of 40-track disk drives, adding another 12K.

be written in one contiguous block.

Using the STAT listing, you have 27K of space on the disk, and the programs you want to save total 32K. So you start by erasing the .ASM files. Next, PIP is used to move the seven files you want to save. Since you can't use duplicate names, tell PIP to make a file copy of each program in turn, but with a file type of .SAV.

Once you have your seven .SAV files, STAT tells you that you have used up all of the disk except a single 1K block. One side benefit of this procedure is that it gives the operator, PIP, and the disk drive a real test and checks out the whole disk surface in the process.

Now Do It All Over Again

Now you create your big hole at the bottom of the disk space by erasing all of the .COM files (are you sure you have everything backed up?). You need a PIP.COM file to use for the move back, so you next have to rename PIP.SAV as PIP.COM. This new PIP is then used to move the .SAV files back down as .COM files. In the process, PIP has to move itself, so you temporarily call this new PIP file by another name.

When you are done with the packing, you erase PIP.COM and rename the packed version of PIP. Now DIR and STAT *.* are used

to inspect the new packed system disk. You have 46K of workspace, a reasonable amount for an assembly-language programmer. Since you are talking about a single-drive mini-floppy CP/M system, you should keep in mind that you don't want to get too much work on a single disk anyway, since the only way you have to copy a file is to copy the whole disk.

I have found that this size disk is convenient for assembly-language work, my primary use for the system. A couple of reasonably sized source files and their hex, object and print files will pretty well fill a disk. At that time, it is a good idea to file that disk away for safekeeping.

BASIC is another matter, since BASIC language programs breed like rabbits, but on a single drive system you need only save BASIC itself, and maybe STAT. If you erase everything else on the disk, you will end up with about 40K of workspace.

Even More Space

I ran across a real bargain in Wangco Model 82 mini-floppy drives, and since they can access 40 tracks instead of the standard 35, I had to figure out a method for patching CP/M to make it use the extra track. At the bottom of the listing you will see that I found and patched the location in

CP/M that tells it how much disk space is available.

Five more tracks add $5 \times 10 \times 256$ (12,800) bytes in the North Star format, so I incremented the 4F (hex) by C (hex), which adds an extra 12K to the usable disk space. You will have to be certain that your DOS will properly address 40 tracks before making this patch, however. And note that the GA040 accesses a "write tracks 0 through 2 only" routine in my DOS. Yours will not be at this address.

Comfortable Conclusions

The Wangco drives also permit the use of both sides of each disk, which should be called flippy-disks to avoid confusion with read double-sided-type drives, which have two heads. This combination of two sides and 40 tracks makes a very usable configuration. I'm not anxious to tackle the problems of double density because I find the present configuration reliable and comfortable. Eight-inch floppies are a bit awkward to handle. The stiffer mini-floppies store well, and CP/M is a good operating system for them.

However, even this system needs a single-drive filecopy routine. I have written one, and next month's issue will have a complete assembly-language listing. ■

WORDPRO 3 USERS

Save Time — Personalize Letters

Announcing a USABLE MAIL LIST PROGRAM which lets you make multiple copies of the same letter yet address it to different customers. Designed to interact with Commodore's new Wordpro 3, this program creates the files for variable text eliminating the necessity to run the letter through twice to give it that personalized effect.

Can pay for itself with one use at a minimum investment of \$100.00.

For further details contact:

Micro Computer ✓167
Industries, Ltd.

1520 E. Mulberry, Suite 240
Fort Collins, Co. 80524 (303) 221-1955

Our Ad Manager is Through!

He's just completed production on our new 36 page catalog and he's exhausted.

So, rather than put him right back to work on our August 2 page spread, we're giving him a break.

Look for our regular ad in September. In the meantime, **send for our brand new free catalog.** It's the most complete in the industry.

COMPUMART
270 Third St. Cambridge, Mass 02142
Dept. 128



SS-50 Newsletter™

THE ONLY OTHER ALL 6800
COMPUTER MAGAZINE

Devoted to the 6800 and 6809
hobbyist...Software, Hardware,
fixes, reviews and much more!!

Charter Subscription:
\$12.00-1 Year \$22.00-2 Years
VISA MC
FREE SAMPLE ISSUE
(60 cents in stamps for 1st class)

SS-50 NEWSLETTER™
P.O. Box 402 ✓321
Logan, Utah 84321

6800, 8080, 6502

PROGRAMMERS and HARDWARE MOONLIGHTERS

Small, growing, established company
(\$600K sales) needs experienced pro-
grammers and hardware people in the
Manchester, N.H. area. You will aid our
development of 6800 based "black boxes"
that monitor industrial production/
manufacturing functions. You will inter-
face these units to various mini/micro
computers via RS232 and develop num-
ber crunching/display programs. Posi-
tion(s) could evolve into full time (if
desired) within 12-18 months. This is a
unique opportunity for right individual.

Contact: Karl Ritzinger
Industrial Marine Electronics Inc.
61 Harvey Road - RFD #10 ✓264
Manchester, N.H. 03103
(603) 434-2309

All About

OSI

BASIC-IN-ROM

Ohio Scientific Microsoft BASIC Ver 1.0 Rev 3.2
REFERENCE MANUAL

Complete, Concise, Accurate, Detailed. All
commands, statements, and functions. Maps.
USR. Tapes. Bug fixes. Variable tables.
Source code storage. MONITOR.

Postpaid \$8.95 Send check, or COD

EDWARD H. CARLSON ✓259
3872 RALEIGH DR.
OKEMOS, MI 48864

Dealer Inquiries Welcome



Featuring

RCA 1802
COSMAC CPU

Own a powerful home computer system, starting for just \$99.95—a price that gets you up and running the very first night...with your own TV for a video display. \$99.95 ELF II includes RCA 1802 8 bit microprocessor addressable to 64k bytes with OMA, interrupt, 16 registers, ALU, 256 byte RAM, full hex keyboard, two digit hex output display, stable crystal clock for timing purposes, RCA 1801 video IC to display your programs on any video monitor or TV screen and 5-slot plug-in expansion bus (less connectors) to expand ELF II into a giant!

ELF II Explodes Into A Giant!

Master ELF II's \$99.95 capabilities, then expand with GIANT BOARD... KLUGE BOARD... 4k RAM BOARDS... TINY BASIC... ASCII KEYBOARD... LIGHT PEN... ELFBUG MONITOR... COLOR GRAPHICS & MUSIC SYSTEM... TEXT EDITOR... ASSEMBLER... DISASSEMBLER... VIDEO DISPLAY BOARD... and, another great reason for getting your ELF II now—

BREAKTHROUGH!

Netronics proudly announced the release of the first 1802 FULL BASIC, written by L. Sandlin, with a hardware floating point RPN math package (requires 8k RAM plus ASCII and video display boards), \$79.95 plus \$2 p&h. Also available for RCA VIP and other 1802 systems (send for details)!

Master This Computer In A Flash!

Regardless of how minimal your computer background is now, you can learn to program on ELF II in almost no time at all. Our Short Course On Microprocessor & Computer Programming—written in non-technical language—guides you through each of the RCA COSMAC 1802's capabilities, so you'll understand everything ELF II can do...and how to get ELF II to do it! Don't worry if you've been stumped by computer books before. The Short Course represents a major advance in literary clarity in the computer field. You don't have to be a computer engineer in order to understand it. Keyed to ELF II, it's loaded with "hands on" illustrations. When you're finished with the Short Course, neither ELF II nor the RCA 1802 will hold any mysteries for you.

In fact, not only will you now be able to use a personal computer creatively, you'll also be able to read magazines such as BYTE...INTERFACE AGE...POPULAR ELECTRONICS and PERSONAL COMPUTING and fully understand the articles. And, you'll understand how to expand ELF II to give you the exact capabilities you need!

If you work with large computers, ELF II and the Short Course will help you understand what they're doing.

Get Started For Just \$99.95, Complete!

\$99.95 ELF II includes all the hardware and software you need to start writing and running programs at home, displaying video graphics on your TV screen and designing circuits using a microprocessor—the very first night—even if you've never used a computer before.

ELF II connects directly to the video input of your TV set, without any additional hardware. Or, with an \$8.95 RF modulator (see coupon below), you can connect ELF II to your TV's antenna terminals instead.

ELF II has been designed to play all the video games you want, including a fascinating new target/missile gun game that was developed specifically for ELF II. But games are only the icing on the cake. The real value of ELF II is that it gives you a chance to write machine language programs—and machine language is the fundamental language of all computers. Of course, machine language is only a starting point. You can also program ELF II with assembly language and tiny BASIC. But ELF II's machine language capability gives you a chance to develop a working knowledge of computers that you can't get from running only

Write and run programs—the very first night—even if you've never used a computer before!

You're up and running with video graphics for just \$99.95—then use low cost add-ons to create your own personal system that rivals home computers sold for 5-times ELF II's low price!

pre-recorded tape cassettes.

ELF II Gives You The Power To Make Things Happen!

Expanded, ELF II can give you more power to make things happen in the real world than heavily advertised home computers that sell for a lot more money. Thanks to an ongoing commitment to develop the RCA 1802 for home computer use, the ELF II products—being introduced by Netronics—keep you right on the outer fringe of today's small computer technology. It's a perfect computer for engineering, business, industrial, scientific and personal applications.

Plug in the GIANT BOARD to record and play back programs, edit and debug programs, communicate with remote devices and make things happen in the outside world. Add KLUGE (prototyping) Board and you can use ELF II to solve special problems such as operating a complex alarm system or controlling a printing press. Add 4k RAM Boards to write longer programs, store more information and solve more sophisticated problems.

ELF II add-ons already include the ELF II Light Pen and the amazing ELFBUG Monitor—two extremely recent breakthroughs that have not yet been duplicated by any other manufacturer.

The ELFBUG Monitor lets you debug programs with lightning speed because the key to debugging is to know what's inside the registers of the microprocessor. And, with the ELFBUG Monitor, instead of single stepping through your programs, you can now display the entire contents of the registers on your TV screen. You find out immediately what's going on and can make any necessary changes.

The incredible ELF II Light Pen lets you write or draw anything you want on a TV screen with just a wave of the "magic wand." Netronics has also introduced the ELF II Color Graphics & Music System—more breakthroughs that ELF II owners were the first to enjoy!

ELF II Tiny BASIC

Ultimately, ELF II understands only machine language—the fundamental coding required by all computers. But, to simplify your relationship with ELF II, we've introduced on ELF II Tiny BASIC that makes communicating with ELF II a breeze.

Now Available! Text Editor, Assembler, Disassembler And A New Video Display Board!

The Text Editor gives you word processing ability and the ability to edit programs or text while it is displayed on your video monitor. Lines and characters may be quickly inserted, deleted or changed. Add a printer and ELF II can type letters for you—error-free—plus print names and addresses from your mailing list!

ELF II's Assembler translates assembly language programs into hexadecimal machine code for ELF II use. The Assembler features mnemonic abbreviations rather than numerics so that the instructions on your programs are easier to read—this is a big help in catching errors.

ELF II's Disassembler takes machine code programs and produces assembly language source listings. This helps you understand the programs you are working with...and improve them when required.

The new ELF II Video Display Board lets you generate a sharp, professional 32 or 64 character by 16 line upper and lower case display on your TV screen or video monitor—dramatically improving your unexpanded \$99.95 ELF II. When you get into longer programs, the Video Display Board is a real blessing!

Now Available!

☐ A-D/D-A Board Kit includes 1 channel (expandable to 4) D-A, A-D converters, \$39.95 plus \$2 postage & handling..

☐ PILOT Language—A new text-oriented language that allows you to write educational programs on ELF II with speed and ease! Write programs for games...unscrambling sentences...spelling drills...fill in the missing word" tests, etc. PILOT is a must for any ELF II owner with children. PILOT Language on cassette tape, only \$19.95 postpaid!

☐ Game Package on cassette tape (requires 4k RAM), \$9.95 plus \$2 postage & handling.

Clip Here and Attach to Your Order Below!

Netronics R&D Ltd., Dept. K-8
333 Litchfield Road, New Milford, CT 06776

Yes! I want my own computer! Please rush me—

☐ RCA COSMAC ELF II kit at \$99.95 plus \$3 postage and handling (requires 6 to 8 volt AC power supply)

☐ Power Supply (required). \$4.95 postpaid

☐ RCA 1802 User's Manual. \$5 postpaid

☐ Tom Pittman's Short Course On Microprocessor & Computer Programming teaches you just about everything there is to know about ELF II or any RCA 1802 computer. Written in non-technical language, it's a learning breakthrough for engineers and laymen alike. \$5 postpaid

☐ Deluxe Metal Cabinet with plexiglas dust cover for ELF II. \$29.95 plus \$2.50 p&h

☐ I am also enclosing payment (including postage & handling) for the items checked below!

☐ I want my ELF II wired and tested with power supply, RCA 1802 User's Manual and Short Course—all for just \$149.95 plus \$3 p&h.

☐ GIANT BOARD™ kit with cassette I/O. RS 232 C/TTY I/O. 8 bit P/I/O decoders for 14 separate I/O instructions and a system monitor/editor. \$39.95 plus \$2 p&h

☐ Kluge (Prototype) Board accepts up to 16 IC's \$17.00 plus \$1 p&h

☐ 4k Static RAM kit. Addressable to any 4k page to 64k. \$89.95 plus \$3 p&h

☐ Gold plated 86-pin connectors (one required for each plug-in board). \$5.70 ea. postpaid

☐ Expansion Power Supply (required when adding 4k RAM). \$34.95 plus \$2 p&h

☐ Professional ASCII Keyboard kit with 128 ASCII upper/lower case set, 96 printable characters, onboard regulator, parity logic selection and choice of 4 hand shaking signals to mate with almost any computer. \$64.95 plus \$2 p&h

☐ Deluxe metal cabinet for ASCII Keyboard. \$19.95 plus \$2.50 p&h

☐ Video Display Board kit lets you generate a sharp, professional 32 or 64 character by 16 line upper and lower case display on your TV screen or video monitor—dramatically improving your unexpanded \$99.95 ELF II. (fits inside ASCII Keyboard cabinet) \$89.95 plus \$2 p&h

☐ ELF II Tiny BASIC on cassette tape. Commands include SAVE, LOAD, ±, ×, ÷, (,). \$19.95 postpaid

☐ Disassembler on cassette tape takes machine code

26 variables A-Z, LET, IF/THEN, INPUT, PRINT, GO TO, GO SUB, RETURN, END, REM, CLEAR, LIST, RUN, PLOT, PEEK, POKE. Comes fully documented and includes alphanumeric generator required to display alphanumeric characters directly on your TV screen without additional hardware. Also plays tick-tack-toe plus a drawing game that uses ELF II's hex keyboard as a joy stick. 4k memory required. \$14.95 postpaid

☐ Tom Pittman's Short Course on Tiny Basic for ELF II. \$5 postpaid

☐ ELFBUG™ Deluxe System Monitor on cassette tape. Allows displaying the contents of all registers on your TV at any point in your program. Also displays 24 bytes of memory with full addresses, blinking cursor and auto scrolling. A must for the serious programmer! \$14.95 postpaid

☐ Text Editor on cassette tape gives you the ability to insert, delete or edit lines and words from your programs while they are displayed on your video monitor. (Add printer and you can use ELF II to type error-free letters plus insert names and addresses from your mailing list.) \$19.95 postpaid

☐ Assembler on cassette tape translates assembly language programs into hexadecimal machine code for ELF II use. Mnemonic abbreviations for instructions (rather than numerics) make programs easier to read and help prevent errors. \$19.95 postpaid

☐ Disassembler on cassette tape takes machine code

PHONE ORDERS ACCEPTED!
Call (203) 354-9375

Total Enclosed \$

(Conn. res. add tax)

CHARGE IT! Exp. Date

☐ Visa ☐ Master Charge

(Bank #)

Account #

programs and produces assembly language source listings to help you understand and improve your programs \$19.95 on cassette tape

SAVE \$9.90—Text Editor, Assembler & Disassembler purchased together, only \$49.95! (Require Video Display Board plus 4k memory.)

☐ ELF II Light Pen, assembled & tested. \$7.95 plus \$1 p&h

☐ ELF II Color Graphics & Music System Board kit \$49.95 plus \$2 p&h

☐ ELF II connects directly to the video input of your TV set without additional hardware. To connect ELF II to your antenna terminals instead, order RF Modulator. \$8.95 postpaid

Coming Soon: A-D, D-A Converter, Controller Board and more!

Print Name

Address

City

State Zip

CALL TOLL FREE: 800 243-7428

DEALER INQUIRIES INVITED

Some Notes on Termination

Protect your program from those incessant glitches.

Reo W. Pratt
2264 Cambridge Dr. SE
Grand Rapids, MI 49506

```
D400 C3 JMP
D401 00 D400
D402 D4
```

Listing 1. "Jump to here" program.

The ad said, "Eliminates noise, ringing, cross talk and overshoot!" It claimed that if you had any inexplicable problems, such as your system running fine and suddenly "crashing," the cause might be an unterminated motherboard. Proper termination will eliminate those frustrating "glitches" that appear only long enough to de-

stroy the program you keyed in.

I recently had the opportunity to verify these claims with the help of Bill Godbout and two of his technical staff. Although most computerists accept the need for bus termination (most motherboards come with on-

board termination now), you might be interested in the results of the tests I ran, particularly if you own or are planning to buy one of the older S-100 computers with an unterminated motherboard.

The Reason for Termination

When a signal or pulse is sent out on a bus line, it has to go somewhere. Many pulses placed on the bus by the processor are not used by other devices plugged into the board. When these pulses reach the end of an unterminated line, they bounce

back, induce signals in adjacent lines, radiate into space—or some combination of all three.

The degree to which this occurs depends on several inter-related factors. The most significant are the signal frequency, the length of the conductor and the spacing between adjacent conductors. The higher the frequency, the more critical proper termination becomes. Even the slowest microprocessors deal with frequencies well into the radio-frequency spectrum. If you have trouble accepting this, remember that the clock fre-

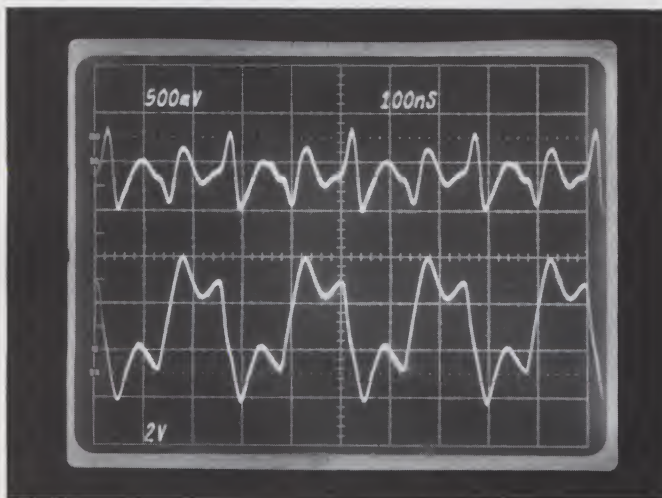


Photo 1. \overline{POC} and \overline{CLOCK} lines with active termination enabled.

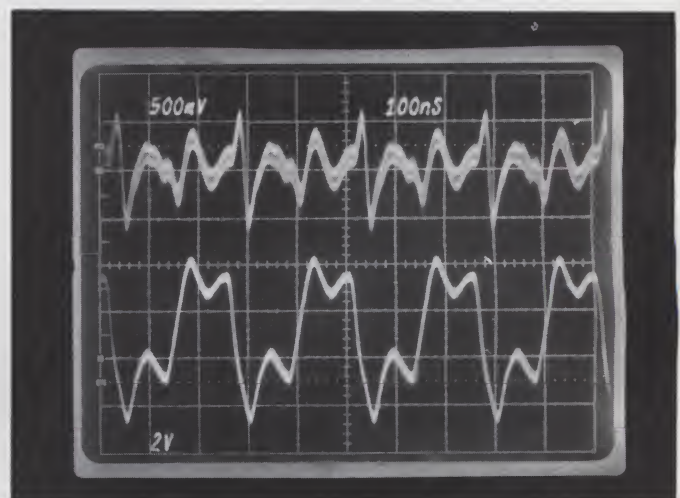


Photo 2. \overline{POC} and \overline{CLOCK} lines without termination.

quency of an 8080 is 2 MHz. This is much higher in the spectrum than the highest point on your AM dial (1.6 kHz).

Termination Problems

Noise is electrical energy on the bus that shouldn't be there. It comes from a variety of sources and, once it appears, won't go away—until you start to look for it.

Ring occurs when a signal that is changing logic level (pulled high or low) doesn't stay at its intended level. This appears as a damped oscillation in the photographs.

Cross talk occurs when a signal on one line is imprinted on the line or lines adjacent to it. It causes confusion when the altered signal arrives at its destination.

Overshoot happens when a signal changes logic state with such force that it "shoots" past its intended level. It is closely associated with, and precedes, ringing.

To observe these problems, I used a Tektronix oscilloscope with 50 MHz bandwidth and dual-trace capability. I observed the various signal lines on an "older" Imsai 8080 with a Godbout active-terminator board that unplugged to look at the terminated and unterminated lines. I recorded the oscilloscope pictures with a 4x5 Graphex camera with a Polaroid back.

To keep the processor continually cycling during the test, I keyed in a short "jump to here" program (see Listing 1).

Photo 1 shows POC (top) and CLOCK lines. It is an excellent example of cross talk. Note how the POC line appears to follow the CLOCK line up and down. Note also that the POC voltage scale is set to 1/4 the value of the CLOCK line—500 millivolts, as compared to two volts for the CLOCK trace. If the voltage scales were the same, the varia-



Fig. 1. Passive termination.

tions in the upper trace would not be as pronounced.

The terminator board improves the situation. Photo 1 shows the terminating network enabled. Photo 2 shows the effects of no termination. Noise, cross talk, undershoot and overshoot are all present in ample quantities. Compare the same portions of both traces. As you can see from the scope's illuminated graticule, the camera was well focused. The thickness of the traces, particularly the upper one, is due to noise, not poor photography.

Photos 3 and 4 show the PDBIN line in the upper trace and the DI7 line in the lower trace. The terminator board is enabled in Photo 3; it is removed from the machine in Photo 4. These photos show best how the terminator board reduces overshoot and ringing. Using two volts per division as shown on the scope face, you can see that the high logic level with the terminator in is only about three volts, whereas it is over four volts with no termination.

Technical Aspects of Termination

Amateur radio operators are familiar with the principles of termination through antenna and transmission-line theory. The bus lines in a computer carry a signal from one point to another as does a transmission line. The terminating network in a computer does more than just provide a proper load to sink signal current. It also sources current for logic signals that may lack sufficient drive and holds the logic high voltage at the optimum level.

Ones and zeros are generally represented by five and zero volts, respectively. However, a look at a data sheet shows that most TTL gates view anything over two volts as logic high, with 2.6 volts optimum. Holding the logic-high-state voltage to the optimum reduces overshoot since the signal only has half as far to go when it changes state.

Fig. 1 shows the simplest form of termination: two resistors for each line wired to the 5 volt "rail" and ground to source and sink current as required. It is

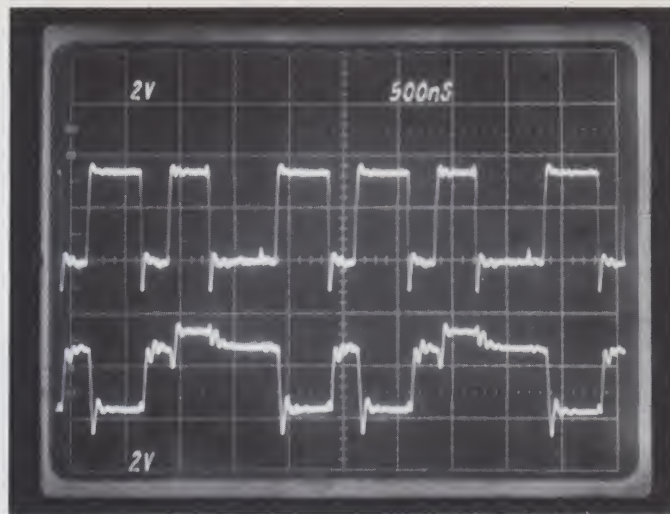


Photo 3. PDBIN and DI7 lines. Termination enabled.

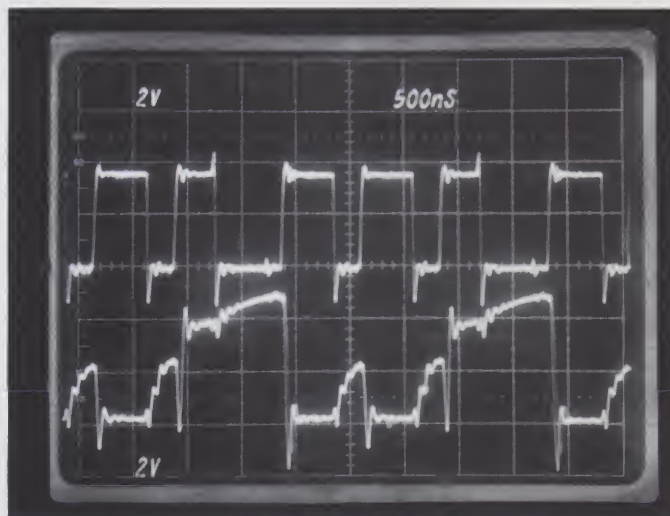


Photo 4. PDBIN and DI7 lines. Terminator removed from bus.

effective but has one drawback. With all those resistors wired between +5 volts and ground for nearly 100 lines, the power supply has an increased load to bear. If you apply Ohm's law, you'll find that the extra load is about 1/2 Amp. This may not be too much, depending on the system, but there is a better way.

Active termination has all the advantages of passive termination but draws far less current from the power supply and costs the same or less. Active termination uses only one resistor per line instead of two and a sensing network composed of an operational amplifier that sinks or sources current only as it is needed. It effectively "switches" the terminating net-

work on and off the bus lines as required, eliminating the constant power draw. Total constant current draw on the Godbout active terminator board, for example, is only 20 milliamperes.

Proper termination of the lines on a motherboard or backplane is simply a design necessity that never should have been omitted from the original S-100 systems. Recently advertised motherboards from Godbout have Faraday shielding between the lines as well as active termination networks on the board. Other manufacturers also advertise similar boards. Look into the "termination situation" carefully. It could save a lot of frustration in your computing future. ■

Fastfind

For the computerist in a hurry to search large arrays.

Bill Roch
24000 Bessemer St.
Woodland Hills, CA 91367

This article describes a fast way to find a match between a variable and a variable in an array. One way to do this is to use a number of IF statements (see Example 1).

This is fine for checking a couple of variables, but why write the same thing over and over again when you can do it with a FOR-NEXT loop in three or four statements? The FOR-NEXT loop is a better way to find a match between a single variable and a variable in a small array (see Example 2).

This is an excellent method if the array is small or the program only executes this loop a

few times. However, if the array contains 1000 variables or the program uses this loop for every record it processes, the computer will spend a lot of time "spinning its wheels," i.e., comparing nonmatching variables.

The same waste of time occurs when the computer searches for the matching index or key in a sequential random file. Most of the computer time is spent asking, "Do I have a match?" and answering "No—Go get the next record."

With a FOR-NEXT loop, the average search will be made through half of the array to find a match—all wasted time except for the final match.

A Faster Way

Using the FASTFIND routine on an array of 1000 sequential variables will only require a maximum of ten tries to find any variable in the array.

To find 999 in an array of 1000

the first attempted match would be on 500. Since the array variable of 500 is less than the 999 being looked for, the next attempt is made at 750. The next attempt would be at 875. Each time the area to search is cut in half. This continues until the match is found.

Table 1 shows the calculated subscript used to find a match for the number 955 in an array of 1 to 1000. The low subscript number is set to 0, and the high is set to 1001. As before, the first attempted match is made at 500—low + high divided by two. The value 955 is higher than 500 so the 500 is used as the low subscript number and the process is repeated.

This continues until the 955 is lower than the calculated subscript number, at which time the calculated subscript is substituted for the high subscript number. Decimal numbers are rounded down (turned into integers) so that one half of

(938 + 1001) equals 969, not 970. On the ninth iteration the number 955 matches the subscript.

Why is the low-high range 0 to 1001, while the actual range to be searched is from 1 to 1000? This is done so the subscripts 1 and 1000 will find a match. Otherwise, we get $1+2=3$ and half of $3=1$, so subscript 2 is never found. At the other end we have $1000+999=1999$, and half of $1999=999$ —another endless loop.

Routines

Two sample routines are provided; each has a test driver program for testing the routine. Listing 1 is in standard BASIC, and Listing 2 is in Tarbell TBASIC, which makes use of some of the TBASIC features. Both programs do the same thing. Listing 1 fastfinds a number, while Listing 2 fastfinds a string.

Listing 1 illustrates FASTFIND for a number match. The program first builds an array containing 1000 variables ranging from 1 to 3001 using every third number (1,4,7,... 3001). The printed output from this program shows the count of the tries it took to find a match for the entered variable. When the number entered from the keyboard is out of range, the program requests that a correct number be reentered.

When the number entered from the keyboard is not found,

```
10 IF A=B(1) GOTO 100
20 IF A=B(2) GOTO 200
.
.
100 IF A=B(10) GOTO 1000
```

Example 1.

```
10 FOR K=1 TO 10
20 IF A=B(K) GOTO 50
30 NEXT K
40 PRINT "ERROR": STOP
50 ON K GOTO 100,200,... 1000
```

Example 2.

Low subscript number	High subscript number	Low & High divided by 2	Number related to subscript
0	1001	500	Higher
500	1001	750	Higher
750	1001	875	Higher
875	1001	938	Higher
938	1001	969	Lower
938	969	953	Higher
953	969	961	Lower
953	961	957	Lower
953	957	955	Match

Table 1. Locating the subscript for 955.

FASTFIND ROUTINE

```

ENTER ARRAY VALUE:? 1
9 TRYS - ARRAY VALUE [ 1 ] IN A(1)

ENTER ARRAY VALUE:? 3
10 TRYS - ARRAY VALUE [ 3 ] NOT FOUND
NEXT LOWEST ARRAY VALUE IS [ 1 ] IS IN A(1)

ENTER ARRAY VALUE:? 4
10 TRYS - ARRAY VALUE [ 4 ] IN A(2)

ENTER ARRAY VALUE:? 3001
8 TRYS - ARRAY VALUE [ 3001 ] IN A(1001)

ENTER ARRAY VALUE:? 3000
10 TRYS - ARRAY VALUE [ 3000 ] NOT FOUND
NEXT LOWEST ARRAY VALUE IS [ 2998 ] IS IN A(1000)

ENTER ARRAY VALUE:? 2998
10 TRYS - ARRAY VALUE [ 2998 ] IN A(1000)

ENTER ARRAY VALUE:? 1504
1 TRYS - ARRAY VALUE [ 1504 ] IN A(502)

ENTER ARRAY VALUE:? 1000
9 TRYS - ARRAY VALUE [ 1000 ] IN A(334)

```

Sample standard BASIC run.

```

Enter Array Value: AA00
9 Trys - Array Value [AA00] is in ARRAY$(1)

Enter Array Value: EJ90
1 Trys - Array Value [EJ90] is in ARRAY$(500)

Enter Array Value: JJ90
10 Trys - Array Value [JJ90] is in ARRAY$(1000)

Enter Array Value: AA10
10 Trys - Array Value [AA10] is in ARRAY$(2)

Enter Array Value: AA01
10 Trys - Array Value [AA01] NOT FOUND
Next Lowest Array Value is [AA00] in ARRAY$(1)

Enter Array Value: AA09
10 Trys - Array Value [AA09] NOT FOUND
Next Lowest Array Value is [AA00] in ARRAY$(1)

Enter Array Value: BA40
8 Trys - Array Value [BA40] is in ARRAY$(105)

```

Sample Tarbell BASIC run.

```

10 REM *****
20 REM **
30 PRINT "FASTFIND ROUTINE"
40 REM ** TEST PROGRAM **
50 REM ** BY **
60 REM ** BILL ROCH **
70 REM ** Standard Basic **
80 REM *****
90 REM
100 DIM A(1004)
110 J=0
120 FOR K=1 TO 3002 STEP 3:REM BUILD AN ARRAY
130 J=J+1
140 A(J)=K:REM RANGE 1 TO 3001
150 NEXT K:REM 1,4,7,...,3001
160 L1=0:REM LOWEST SUBSCRIPT VALUE MINUS 1
170 H1=J+3:REM HIGHEST SUBSCRIPT VALUE PLUS STEP
180 PRINT:INPUT "ENTER ARRAY VALUE:? ";B
190 IF B<L1 OR B>K-3 THEN GOTO 160:REM OUT OF RANGE
200 GOSUB 400
210 PRINT C1;"TRYS - ARRAY VALUE [";B;"] ";
220 ON E1 GOTO 250
230 PRINT "IN A(";STR$(K1);")"
240 GOTO 160
250 PRINT "NOT FOUND"
260 PRINT "NEXT LOWEST ARRAY VALUE IS [";A(K1);"]";
270 PRINT "IS IN A(";STR$(K1);")"
280 GOTO 160
290 REM
300 REM *****
310 REM **
320 REM ** FASTFIND ROUTINE **
330 REM **
340 REM *****
350 REM
360 REM INPUT TO ROUTINE
370 REM B - VALUE TO FIND IN ARRAY A(X)
380 REM L1 - LOWEST ARRAY SUBSCRIPT
390 REM H1 - HIGHEST ARRAY SUBSCRIPT
400 REM OUTPUT FROM ROUTINE
410 REM C1 - NUMBER OF TRYS COUNT
420 REM E1 - ERROR FLAG
430 REM 0 = FOUND
440 REM 1 = NOT FOUND
450 REM K1 - SUBSCRIPT NUMBER IN ARRAY
460 REM CONTAINING FOUND VALUE
500 E1=0:REM RESET NOT FOUND FLAG
510 C1=0:REM ZERO FIND COUNTER
520 K1=INT((L1+H1)/2):REM CALCULATE FIND NO.
530 IF K1<>L1 THEN GOTO 560:REM IF CALC NO = LOW NO - NOT FOUND
540 E1=1:REM SET NOT FOUND FLAG
550 GOTO 640
560 C1=C1+1:REM ADD 1 TO TRY COUNTER
570 IF B=A(K1) THEN GOTO 640
580 IF B>A(K1) THEN GOTO 600
590 IF B<A(K1) THEN GOTO 620
600 L1=K1:REM MAKE LOW SUBSCRIPT = POINTER
610 GOTO 520
620 H1=K1:REM MAKE HIGH SUBSCRIPT = POINTER
630 GOTO 520
640 RETURN

```

Listing 1. FASTFIND routine in standard BASIC.

the program sets a NOT FOUND flag and prints out NOT FOUND. It also prints out the next lowest array value and its subscript position in the array.

The Tarbell BASIC program (Listing 2) illustrates how the FASTFIND routine could be used in finding selected sequential keyed records in a random file. The test program first creates an array containing string values, simulating a sequential set of record keys.

These keys (or index) range from AA00 through JJ90 (AA00,AA10,AA20...AB00...JJ90). This string array could consist of names, part numbers, account numbers, policy codes, etc. The program using the FASTFIND routine would first read all the keys or IDs into an array similar to the one generated by the program.

The routine in this program operates in the same manner as the standard BASIC routine. It keeps cutting the search range in half until a match is found. When the match is found, the subscript number becomes the record number for the file read from a random file.

If no match is found, the routine will return an error flag that causes the NOT FOUND to be printed. The next lowest array value with the subscript of that value is also printed.

It may be that 80 percent of the time the desired record is in the top (high subscript values) end of the file. Instead of going in at the middle of the file and

calculating all the way to the number, go in just below where most of the action is. This will save two or three extra attempted matches.

Suppose the routine is being used with a name file that keys on names. In the case of a filename with five JONESes, the routine will return as soon as it finds a JONES. There is one chance in five that it found the right JONES, and it will always find the same JONES and return the same subscript value. By adding to or subtracting from the subscript, the desired record can be found.

Another way would be to subtract five from the subscript and use a FOR-NEXT loop to find a match on JONES and JONES' first name.

Three nice features of Tarbell's TBASIC are shown in Listing 2:

- Meaningful line labels instead of line numbers.
- Long variable names.
- Ability to transfer variables with the GOSUB, RETURN and RECEIVE statements.

Summary

Considerable computer time can be saved using a FAST-FIND routine instead of a FOR-NEXT loop when searching large arrays. A routine of this type can work equally well with strings and numbers. The number of reads required to find the proper key in a random file can be greatly reduced. ■

```
TSTPROG REM *****
REM **
REM ** FAST FIND ROUTINE **
REM ** TEST PROGRAM **
REM ** by **
REM ** BILL ROCH **
REM ** Tarbell Basic **
REM *****

START DIM ARRAY$(1001): FALSE=0: TRUE=1
      CNTR=0: ZERO=0
      FOR K1=1 TO 10: A$=CHR$(64+K1):REM BUILD TEST ARRAY
      FOR K2=1 TO 10: B$=CHR$(64+K2):REM AA00,AA10,AA20....
      FOR K3=1 TO 10: CNTR=CNTR+1:REM AA90,AB00....JJ90
      ARRAY$(CNTR)=A$+B$+STR$(K3-1)+"0"
      NEXT K3,K2,K1

TSTLOOP PRINT :INPUT "Enter Array Value: ";INPUT$
      IF LEN(INPUT$)<>4 THEN PRINT "NOT 4 CHARACTERS":GOTO TSTLOOP
      IF INPUT$<"AA00" OR INPUT$>"JJ90" THEN GOTO TSTLOOP
      LOW=ZERO: HIGH=CNTR+1
      GOSUB FASTFIND,LOW,HIGH,INPUT$
      RECEIVE ERRFLG,TRYCOUNT,SSSCRIPT
      PRINT TRYCOUNT;"Trys - Array Value [";VALUE$;"] ";
      ON ERRFLG GOTO FOUND
      PRINT "NOT FOUND"
      PRINT " Next Lowest Array Value is [";ARRAY$(SSSCRIPT);"]";
      PRINT " in ARRAY$(";STR$(SSSCRIPT);")"
      GOTO TSTLOOP

FOUND PRINT "is in ARRAY$(";STR$(SSSCRIPT);")"
      GOTO TSTLOOP

REM *****
REM **
REM ** FAST FIND ROUTINE **
REM **
REM *****

REM INPUT TO ROUTINE
REM BOTTOM - LOWEST ARRAY SUBSCRIPT
REM TOP - HIGHEST ARRAY SUBSCRIPT
REM VALUE$ - VALUE TO FIND IN ARRAY ARRAY$(X)

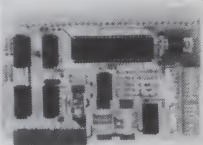
REM OUTPUT FROM ROUTINE
REM FLAG - ERROR FLAG
REM FALSE = NOT FOUND
REM TRUE = FOUND
REM COUNT - COUNT OF TRYs
REM POINTER- SUBSCRIPT NUMBER IN ARRAY
REM CONTAINING FOUND OR NEXT
REM LOWEST VALUE

FASTFIND RECEIVE BOTTOM, TOP, VALUE$
      FLAG=TRUE: COUNT=ZERO
      SETPNTR POINTER=INT((BOTTOM+TOP)/2):REM CALC FIND NUMBER
      IF POINTER<>BOTTOM THEN GOTO FIND
      FLAG=FALSE: GOTO RETURNX
      FIND COUNT=COUNT+1
      IF VALUE$=ARRAY$(POINTER) THEN GOTO RETURNX
      IF VALUE$>ARRAY$(POINTER) THEN BOTTOM=POINTER: GOTO SETPNTR
      TOP=POINTER: GOTO SETPNTR
      RETURNX RETURN FLAG,COUNT,POINTER
```

Listing 2. FASTFIND routine in Tarbell BASIC.

SS-50

- CALENDAR - CLOCK
- INTERRUPT GENERATOR
- BATTERY BACK-UP
- PARALLEL I/O PORT
- SAMPLE FORMAT: SAT JUL 26 1980 10:30:24 PM



CLK 68-1 - The crystal controlled 30 pin I/O board provides a real time calendar/clock. The batteries are recharged when the computer is on & will keep the clock running 3 months or more without power. (No off-board components needed.) Time/date is read (12 or 24 hour format) and set using the software provided in the 36 page manual. Includes sample BASIC program to read time, patch for TSC assembler to print time/date at top of each page, and interrupt examples. Generates interrupts at intervals from 488 microsec. to 256 sec. Professional board is solder masked, silk screened, & fully socketed. NO jumpers (uses DIP switches). Includes fully buffered parallel I/O port for printer, keyboard, etc. Options include: Software on Smoke Signal Disk (5" or 8") \$14.95, Gold Bus connectors \$7.50, 2 MHz parts \$2.50, and Manual only (refundable with purchase of CLK). Available for **IMMEDIATE DELIVERY**.
CLK 68-1 KIT \$89.95 A & T \$119.95

FILES\$ - Program lists SSB directory alphabetically in from 1 to 6 columns (long or short form) - supports wild cards. Also includes transients to convert hexadecimal to decimal and decimal to hex. Specify 5" or 8" SSB disk. \$14.95

NINE TRACK TAPE CONTROLLER Available soon. Provide backup for data storage or exchange with large mainframe systems. \$595.00

AUTHORIZED SMOKE SIGNAL BROADCASTING DEALER
ROBERTSON ELECTRONICS ADD \$2.50 PER ORDER FOR SHIPPING AND HANDLING
1003 WARM SANDS DR. SE
ALBUQUERQUE, NM 87123 ✓ 102 PH. (505) 294-0025

Factory Direct Products for Your NEW! Computer & Your Home NEW! the BRUTES™

Heavy duty solid-state AC switches control your water heater or other heavy loads. Opto-isolated - 1500VAC isolation. All units pretested & baked in oven. TTL logic level compatible - 5V @ 20-50 ma.

TA-4020	120/240VAC @ 40A	\$49.95
TA-8020	480 VAC @ 40A	\$49.95
TA-2030	120 VAC @ 60A	\$99.95
TA-4030	240 VAC @ 60A	\$99.95

the WATCHDOG™ \$29.95

Power failure plugs into standard outlet. Audible buzzer lets you know immediately when power fails. Alerts you to check your freezer, compressors, alarm clock, and other critical devices you depend on.

the SPIKE-SPIKER™ \$44.95

Power console w/solid-state transient absorber plus conducted RF "hash" filters. Compact desktop unit comes complete with integral on-off switch, fuse, pilot light, and 8 120 VAC protected & individually switched convenience outlets. Helps protect valuable equipment from lightning, power line transients and other interference. Makes it easy to turn off all your equipment at one time. No more unplugging & replugging a zillion power cords.

Kalglo Electronics Co. Inc. ✓ 222

Colony Drive I.P., Box 2062, Bethlehem, PA 18001

215-865-0006

Out of state call toll free 1-800-523-9685

Master Charge, VISA, Check w/order or COD

Moonshadow Text Formatter for UCSD Pascal™ Systems

The UCSD Pascal™ system contains a screen-oriented text editor which is convenient, but which is not suited to word processing. It cannot underline, paginate automatically, or perform other essential text-processing functions. The **Moonshadow Text Formatter (MTF)** from Merrimack Systems solves this problem.

With the Moonshadow Text Formatter, documents produced with the screen editor are post-processed to provide these missing functions. It takes standard Pascal text files, operates on them, and sends fully formatted text output to the console display, a printer, or a disk file.

Moonshadow Text Formatter provides, in addition to a full range of formatting functions, advanced features including the combination of files into one document, variables in text (for form letters), and output character translation.

The Moonshadow Text Formatter is written in UCSD Pascal™, and is available for North Star Apple II, LSI-II, and 8080/Z80 systems with IBM Format 8" floppy disks.

All this for \$125.00 from

Merrimack Systems

POB 5218

Redwood City, CA 94063

(415) 365-6281

California residents should include 6% sales tax. Also available: North Star Pascal personalization for SOL/SOLOS — just transfer three files and you're up with Pascal. \$25.00

GET Paid for using your Computer

FUN!

Easy

RUSH COUPON FOR
FREE FACTS



GREAT SPARE TIME

Send today to DAR M8

3110 Fulton Ave., Sacramento CA 95821 ✓ 136

CASH	
NAME	
STREET	
CITY	
STATE	ZIP

FREE ADVERTISING

The Software Trader ✓ 229

423 Bedford Rd.

Schenectady, NY 12308

The classified magazine devoted to microcomputer software, exclusively. Let us help end your search for software. Be sure to write your ad exactly as you want it printed.

Subscription rate \$7.00 per year (12 issues).

Advertising rates:

All user, noncommercial, or club advertising is free. The only requirement for free advertising is; be a subscriber.

Commercial and display advertising is also free, you pay only if you sell your product or service, at the following rates:

For each 47 character line, per issue. \$1.62

For each 2" wide x 3" long camera ready

display ad per issue. \$17.25

For each 4" wide x 3" long camera ready

display ad per issue. \$34.50

NOTE: Display ads will be accepted in only 2 sizes; 2" w x 3" l & 4" w x 3" l

FLOPPY SAVER

Floppy disks and programs are expensive. If you are losing programs and floppy disks due to damaged center holes, FLOPPY SAVER is the answer. FLOPPY SAVER will save disks already damaged and will protect new disks for many times normal life. FLOPPY SAVER will prevent scuffing, crimping and dimpling caused by the hub drive. FLOPPY SAVER is a 7-mil mylar reinforcing ring with a super adhesive backing. FLOPPY SAVER kit (25 rings and tool) is only \$14.95 for 5 1/4" disk, \$16.95 for 8", postpaid.

Visa / MasterCard accepted.

Dealer inquiries invited.

TRI-STAR CORPORATION ✓ 233

P. O. Box 1727 • Grand Junction, CO 81502

(303) 243-5200

MAILROOM PLUS®

Make Your TRS 80 Work Like A Mini-IBM!

Mailroom Plus was developed for the National Rifle Association membership mailings. It features sorting by last name or member number in addition to zip code. The program will sort 500 names in 30-40 minutes, kill duplicates, and close up the file. Mailroom Plus will also search all records for category, name, state, zip (or any other search code) and print these records on labels or in tabular form. It separates large files into smaller ones by state or zip or merges small files into one large one. Mailroom Plus is available on 32-48K disk for \$75.00 by first class mail. Order yours today postpaid.

THE PERIPHERAL PEOPLE ✓ 112

PO Box 524, Mercer Island, WA 98040

206-232-4505

Master Charge and VISA cards welcomed



TRS-80®

DISK FILE MESS?

Find disk files instantly with the most sophisticated disk indexing program available. Similar Indexing programs exist but none with as many features as FINDISK-II!

AUTOMATICALLY create, sort, print, search a Master Index of all disk files.

AUTOMATICALLY read file names, disk numbers (no hand entry).

AUTOMATICALLY print disk labels (optional).

AUTOMATICALLY update Index from revised disks.

AUTOMATICALLY add optional file descriptions.

AUTOMATICALLY purge disks of unwanted files.

• FINDISK-II (on tape or disk, 32K min) \$20.00

Other powerful programs from Documan available on tape or disk:

• STRUCT-I beam design and moment transfer w/graphics (16K) \$15.00

• SOLAR-I essential calculations for passive solar design (32K) \$30.00

• RIA-I complex analysis of real estate investments (32K) \$30.00

• DEPRECIATE-I calculate, print 12 facts on depreciable items (16K) \$10.00

✓ 145

VISA OR MASTER CHARGE

DOCUMAN SOFTWARE BOX 387-A KALAMAZOO, MI 49005 (616) 344-0805

TRS-80 & OTHER NEEDS FILLED FOR LESS

+ + + COMPATIBLE DISK DRIVES WITH POWER SUPPLY AND CASE—120 DAY WARRANTY + + +

• 40 TRACK (204,800 BYTE/DISK) USE BOTH SIDES, ANTI-CRIMP/POWER PROTECT \$339

• 8 IN. DRIVE & P.S./CASE \$790 WITH P.S./CASE FOR 3 DRIVES \$950

• 77 TRACK (197,120 BYTE) 90 DAY WARRANTY \$450

• 4-DRIVE CABLE \$31 • 10 DISKS-5 IN. @ \$25-8 IN. @ \$39-HARD CASE \$3 & 5

• BASE 2 PRINTER (60 LINE/MIN, 72,80,96,120 or 132 CHAR. LINE BI-DIRECT DOT MATRIX IMPACT 96

CHAR ASCII, 15 BAUD RATES) \$499 2K BUFFER, GRAPHICS, & TRACTOR OPTION AVAIL. • • •

• CENTRONICS 737 \$840 + + + + + CABLE @ \$28

• HARRIS SELECTRIC (WORD PROCESSING-TYPEWRITER & PRINTER) \$790

• LOWER CASE FOR CENTRONICS 779/RADIO SHACK LINE PRINTER 1-EASY INSTALL \$99.95

• UPS (UNINTERRUPTIBLE POWER SUPPLY) PREVENT POWER DROP SURGE OR OUT? FROM \$195

• CAT MODEM (ORIG/ANS) \$157 + + + + + 16K MEMORY SET (200 NANO) \$57

• 16K L2 RADIO SHACK COMPUTER SYSTEM \$649

• APPLE, ATARI, RADIO SHACK MODEL 1/2 HARDWARE/SOFTWARE DISCOUNTED A/R, A/P, G/L, P/R FOR

\$360 or \$100 EA. (MODEL 1) & \$630 OR \$165 EA. (MODEL 2). APPLICATIONS INTERACT & ARE COMPLETE &

PROFESSIONAL. WILL RUN ON OTHER COMPUTERS. THIS IS A SPECIAL INTRODUCTORY PRICE.

• ASK FOR FREE FLYER WITH OUR LOW PRICES—DEALER INQUIRIES INVITED MASS. RESIDENTS ADD

5% TAX—F.O.B. TEWKSBURY—FREIGHT EXTRA.

M/C, VISA OR CHECK ACCEPTED. TRS-80 IS A REG. TRADEMARK OF TANDY CORP.

✓ 140

OMNITEK SYSTEMS — 24 MARCIA JEAN DR., DEPT. K, TEWKSBURY, MA 01876 CALL 617-851-3156



ANNOUNCEMENT

The manufacturer of the FINDEX portable microcomputer with Bubble Memory seeks exclusive distributors. Financial strength and programming know-how necessary. This is not a franchise. For information contact: FINDEX, Inc., 1625 W. Olympic Blvd., #8080 Los Angeles CA USA.

FINDEX

1625 W. Olympic Blvd.
Suite 707 ✓ 245
Los Angeles 90015
California, U.S.A.
Phone (213) 380-6950
(213) 7-FINDEX



TRSpeed-up Revisited

With this mod, you can change speeds on the fly.

Roy A. McCoy W1JCV
Box 757
S. Lancaster, MA 01561

Have you ever wanted faster graphics or CLOAD and CSAVE operations on your TRS-80? Perhaps you've felt that it would be nice if programs, both your own and commercial ones, ran faster. For example, if you're a chess buff and own one of the Microchess programs, I'm sure you've wished you didn't have to wait so long for the computer's next move.

The circuit shown in Fig. 1 and the modifications outlined below came about as a result of my wanting to speed up the Sargon chess program. After making a few inquiries, I learned that the slowness of the program was related to the clock frequency of the TRS-80 CPU. I discussed the problem with my friend, Ed Fortmiller, who is a computer programmer. A week later he came up with the circuit shown in Fig. 1.

After deciding not to use any of the spare gates in the TRS-80, we went to the nearest Radio Shack and purchased the needed parts. During the next week I wired the circuit and made the needed modifications. The cir-

cuit worked the first time around and has been working perfectly ever since.

The total cost of the necessary parts (if purchased at Radio Shack) should be around \$6 or \$7. You will need three or four feet of small gauge hookup wire. If you don't have any available, you'll have to spend an additional \$2 for a roll of no. 22 or 24 stranded hookup wire.

The Z-80 microprocessor in the TRS-80 (known as the CPU) operates on a clock frequency of 1.774 MHz. By changing that frequency to 2.66 MHz you effect a 50 percent speed-up in the overall operation of your TRS-80.

Scott King's article ("TRSpeed-up," *Microcomputing*, September 1979, p. 138) suggests simply installing a manual switch to change the Z-80 clock frequency. However, the problem with this method is that you can't switch frequencies after power-up, because the Z-80's operation is interrupted and the TRS-80 comes to a standstill. The only way to get it going again is to turn the power off and start over.

Manual switching is a problem because the TRS-80's dynamic RAMs must be refreshed periodically by the Z-80 to remember the data stored in them. If the Z-80 is interrupted for more than one millisecond, the

RAMs will not be refreshed and will forget everything they know!... and the TRS-80 will cease to function.

So while manual switching will get your TRS-80 running at 2.66 MHz, you won't be able to run any of your old programs or any commercial programs since they will not load at the new clock frequency. Nor can you load them at 1.774 MHz and then switch to 2.66.

The Circuit

To simplify matters, let's say that the circuit is an electronic switch. It performs the same function as the manual switch referred to earlier and even uses a manual switch.

In this case, however, S1 does not actually switch the clock frequency. It has that effect, but the actual switching is done electronically by two integrated circuits (ICs), 74LS76 and 74LS00. Although the latter IC (hereafter referred to as Z2) is shown as three separate units, it is a single IC.

As can be seen from Fig. 1, Z2 has two separate clock signals coming into it—one from pin 12 of Z56 and one from pin 8 of Z56. The position of S1, which is connected to the 74LS76 (hereafter referred to as Z1), determines which of the signals appears at pin 8 of Z2 and is passed on to

Z72. The output of Z72 goes to the Z-80. Whenever S1 is operated, the switching is done so quickly by Z1/Z2 that neither the Z-80 nor the RAMs are adversely affected. That means that you can change the speed of your TRS-80 after power-up without having to worry about the RAMs' losing their data.

For example, you can load in any program and switch to the 2.66 clock frequency, and the program will run 50 percent faster. You can even change speed while a program is being executed. You can also CSAVE any program that is in the TRS-80's memory at the faster speed so that the next time you wish to CLOAD that program you can do so at the faster speed, thus taking considerably less time.

A schematic diagram of the TRS-80 is helpful (although not necessary) as you undertake the modifications to be described. A complete wiring diagram of the TRS-80, plus other useful information, can be found in the *TRS-80 Microcomputer Technical Reference Handbook*, available at Radio Shack stores.

Although the modifications to the TRS-80 and the wiring of the circuit shown in Fig. 1 are simple and easy to do, I do not recommend that a novice undertake these modifications unless

PSG-80

A Programmable
Music and Sound Synthesizer

MSL

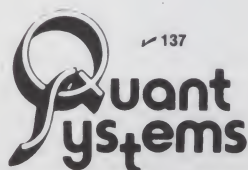
A Programming Language
for Music and Sound Effects

PSG-80—implements what we believe to be the most powerful single chip music and sound synthesizer available today, the General Instruments AY-3-8910. This LSI can simultaneously produce 3 different tones each at a different volume. Plus, it has envelope and noise generators for producing more complex sounds. PSG-80 also contains its own on board amplifier. Requires 2 ports.

MSL—is a Music and Sound effects Language which enables everyone to quickly utilize the powerful resources of the PSG-80. The Language was written to support many PSG-80's simultaneously and contains many special purpose statements, plus many traditional programming structures such as nested loops.

PPI-80—utilizes Intel's 8255 to provide three parallel I/O ports for the TRS-80 and can be connected via the screen printer location on the expansion interface or to the expansion bus at the rear of the keyboard.

PSG-80 plus MSL.....149.00
PPI-80.....119.95



✓ 137

S.C. residents add 4% sales tax
Overseas orders add \$5 for shipping

p.o. box 628
charleston sc
29402

proximately the same size as the circuit board and then glue this piece of material to the bottom of the board. Once the glue has set, apply glue to the bottom side of the foam and press it firmly against the logic board.

Mount S1 (horizontally or vertically) in the hole drilled earlier. Tighten the mounting nut enough to hold S1 firmly in place, but do not overtighten it. Remember that the computer will be in the speeded-up mode when pin 2 of Z1 is grounded.

Solder the wire from pin 8 of Z56 to pin 5 of Z2. Cut away any excess wire. Now solder the wire from the feed-through hole to pin 8 of Z2. Cut away any excess wire. Next solder the wire from pin 12 of Z56 to pin 1 of Z2.

Solder the wire from R30 to the +5 volt point on the small circuit board. Next solder the wire from the ground terminal at the rear of the board to the ground terminal on the small circuit board.

This completes the modification of your TRS-80. Before powering up your unit, I suggest

that you (or a friend) carefully review the modifications to the logic board and the wiring of the small circuit board.

Your TRS-80 will now operate at either 1.774 MHz or 2.66 MHz. To get some idea of the improvement in speed of operation, load one of your programs in at the normal speed, keeping track of the loading time. Now flip the switch to the faster speed and CSAVE the program. Next reload the program (without touching the switch), noting the loading time. Even without looking at a watch you will notice the asterisk blinking much faster.

Another possibility is to enter the following two-line program and measure the time between the appearance of the words GO and STOP.

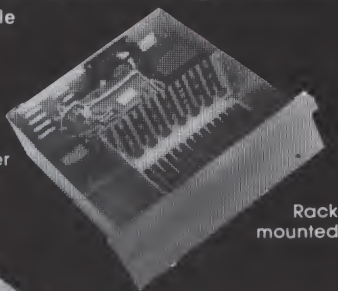
```
10 CLS: FOR J = 1 TO 200: NEXT J: PRINT "GO"
20 FOR N = 1 TO 5500: NEXT N: PRINT "STOP"
```

You're measuring how long it takes the computer to count from one to 5500, and you'll discover that with the Z-80 running at 2.66 MHz it counts 50 percent faster than at 1.774 MHz. ■

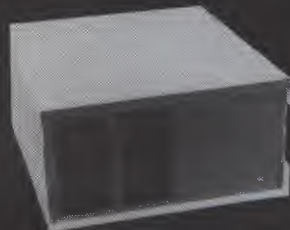
Main/Frames from \$200

Main/Frames from \$200

- 14 Basic Models Available
- Assembled & Tested
- Power Supply:
8v@15A, ± 16v@3A
- 15 Slot Motherboard
(connectors optional)
- Card cage & guides
- Fan, line cord, fuse, power
& reset switches, EMI filter
- 8v@30A, ± 16v@10A
option on some models



Rack
mounted



8" Floppy Main/Frame
(includes power for drives
and mainframe)

Write or call for our
brochure which includes our
application note:

'Building Cheap Computers'

✓ 77

INTEGRAND

8474 Ave. 296 • Visalia, CA 93277 • (209) 733-9288
We accept BankAmericard/Visa and MasterCard

SURPLUS ELECTRONICS

ASCII

ASCII



IBM SELECTRIC
BASED I/O TERMINAL
WITH ASCII CONVERSION
INSTALLED \$645.00

- Tape Drives • Cable
- Cassette Drives • Wire
- Power Supplies 12V15A, 12V25A, 5V35A Others, • Displays
- Cabinets • XFMRs • Heat Sinks • Printers • Components

Many other items. ✓ 122

WORLDWIDE ELECT. INC.

130 Northeastern Blvd.

Nashua, NH 03062

Phone orders accepted using
VISA or MasterCard

TOLL FREE

603-889-7661 • 1-800-258-1036

Attention Dealers



Make Money... Sell

kilobaud

MICROCOMPUTING^{T.M.}

Selling Kilobaud MICROCOMPUTING, the most complete journal of microcomputing, brings the computer enthusiast through your door. Once he's in your store, you can sell him anything.

For information on selling Kilobaud MICROCOMPUTING, call 603-924-7296 and speak with Ginnie Boudrieau, our bulk sales manager, or write to her at Kilobaud Microcomputing, 80 Pine Street, Peterborough, NH 03458.

Our dealers are telling us that Kilobaud MICROCOMPUTING is the hottest-selling computer magazine on the newsstand, so call today and join the ranks of dealers who make money with KM.

kilobaud

MICROCOMPUTING^{T.M.}

80 Pine Street, Peterborough NH 03458

ATTENTION PROGRAMMERS:

Instant Software is looking for more good programs.

YOU may be sitting on a gold mine. The chances are good that you have developed programs for personal, hobby, business or educational use. Such programs could become best sellers in our software line and bring you a substantial monthly royalty check.

Instant Software can save you the time and expense of trying to sell your own software. Our experienced staff of top-notch programmers, marketing and advertising specialists, writers, editors and artists can package your program and make it stand out in the crowd. And . . . Instant Software's proven track record of steadily increasing sales means larger royalties for you.

Our advertising campaign will put your program before the readers of *Kilobaud/Microcomputing*, the *Microcomputing Industry Newsletter*, *80 Microcomputing*, and other national publications. Our aggressive sales force has put Instant Software into more than 250 computer stores across the United States and in several foreign countries. Wherever there are microcomputers, there's Instant Software.

We are looking for good business, utility and education programs on almost any subject. Specifically, for business, we are looking for General Ledger, Cost Accounting, Accounts Receivable/Accounts Payable, Inventory, Order Entry and Payroll programs. They should be interactive, operate from a common data base, and feed into a Trial Balance Sheet and a Profit and Loss Statement. For the utilities, we'd like any system software that is useful, solves problems and will save time and/or effort for other programmers. For educational software, we want tutorial programs, educational simulations, administrator/teacher aids, mixed-media presentations, interactive learning and anything else that's creative and exciting to potential students. Those students can range from preschool age to adults; the subject matter can be anything that you know well. In short, send us software that can solve real problems for the final user.

We are presently looking for software for the following systems: TRS-80 Level II and Model 2, Apple, Heath H-8 and H-89, OSI C1P, Atari, TI 99/4, PET and CP/M.

Submitting programs is easy! Simply send us a disk containing your program or a cassette tape with your program recorded twice on each side. Be sure to include a doublespaced, type-written explanation of (1) what the program does, (2) how to load and use it, (3) what computer it will run on, and (4) who might be interested in buying it. We'd also like a program listing as well as definitions of all variables used in the program. Include a sample data file if necessary. Then send it to:

Instant Software, Inc., Editorial Department
Peterborough, NH 03458

Our reviewers will examine your programs and (assuming we like what we see) you'll be contacted regarding the royalty arrangements.

If you want additional information about Instant Software, send us your name and address. Ask for our software documentation guide, which explains the submission procedure in greater detail.

The market for expertly written and documented software is wide open, and there is a huge demand for programs to keep up with the expanding sales of microcomputers. Get a piece of the action for yourself!

✓ 40

Instant Software Inc.

Peterborough, New Hampshire 03458 603-924-7296

File Dump For FLEX

Become acquainted with your disk files; FD prints them in both ASCII and hex.

Phil Hughes
PO Box 2847
Olympia WA 98507

command area, and therefore it must be saved using the SAVE.LOW command. Once installed, it can be run by entering

FD filespec, where filespec is a standard FLEX file specification, such as 1.MYFILE.TXT. The file will be printed out in hexa-

decimal, and all printable bit combinations will also be printed in ASCII on the right.

Listing 1 shows a sample ex-

FD is a program that prints the contents of disk files in both ASCII and hexadecimal. I originally wrote FD to determine the cause of an incompatibility between the TSC Text Editor and Ed Smith's Macro Assembler. FD is similar to a memory dump in that once you have it, you will find all kinds of reasons to use it.

Before I talk a lot about FD, let me talk a little about FLEX, which is an operating system written by Technical Systems Consultants. It was designed to run on a Southwest Technical Products 6800 computer system with either a mini-floppy or full-sized floppy disk. A new version that runs on a Smoke Signal Broadcasting system is now available. Rumors are that FLEX will also support the hard disk, which is soon to come from SWTP. FLEX does a lot for the user, and, with some additional utility programs, it can do a lot more. FD is such a utility program.

FD should be installed by saving its binary as FD.COMD on your system drive. Note that FD is loaded into the FLEX utility

```
+++FD TESTFILE
0000 54 68 69 73 20 69 73 20 61 20 74 65 73 74 20 66      This is a test f
0010 69 6C 65 20 74 6F 20 73 68 6F 77 20 68 6F 77 20      ile to show how
0020 46 44 20 77 6F 72 68 73 2E 0D 54 68 69 73 20 69      FD works.?This i
0030 73 20 61 20 74 65 78 74 20 66 69 6C 65 2C 20 74      s a text file, t
0040 68 65 72 65 66 6F 72 65 20 65 76 65 72 79 74 68      herefore everuth
0050 69 6E 67 20 69 73 20 70 72 69 6E 74 61 62 6C 65      ind is printable
0060 0D 65 78 63 65 70 74 20 74 68 65 20 63 61 72 72      ?except the carr
0070 69 61 67 65 20 72 65 74 75 72 6E 73 2E 0B 00 00      iase returns.???
0080 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00      ??????????????
0090 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00      ??????????????
00A0 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00      ??????????????
00B0 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00      ??????????????
00C0 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00      ??????????????
00D0 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00      ??????????????
00E0 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00      ??????????????
00F0 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00      ??????????????
```

```
READ PAST END OF FILE
+++LIST TESTFILE
This is a test file to show how FD works.
This is a text file, therefore everything is printable
except the carriage returns.
```

Listing 1. FD printout.

Listing 2. FD and FLEX.

1	0000	NAM	FD	- FLEX FILE DUMP
2	0000	OPT	XRF	
3		* HEX/ASCII FILE DUMP FOR FLEX 2.0		
4		* SSC 7-5-79 V1.4		
5		*:O.FLEX.EQU.INC GET FLEX EQUATES		
6	A0B0	F2LBUF	EQU	X'A0B0' LINE BUFFER
7	AC00	F2BACK	EQU	X'AC00' BACKSPACE CHARACTER
8	AC01	F2DEL	EQU	X'AC01' DELETE CHARACTER
9	AC02	F2EOL	EQU	X'AC02' END OF LINE CHAR.
10	AC03	F2DEPC	EQU	X'AC03' PAGE DEPTH COUNT
11	AC04	F2WIDC	EQU	X'AC04' WIDTH COUNT
12	AC05	F2NULL	EQU	X'AC05' NULL COUNT
13	AC06	F2TABC	EQU	X'AC06' TAB CHARACTER
14	AC07	F2DX	EQU	X'AC07' DUPLEX MODE
15	AC08	F2EJC	EQU	X'AC08' EJECT COUNT
16	AC09	F2PAUS	EQU	X'AC09' PAUSE CONTROL
17	AC0A	F2ESC	EQU	X'AC0A' ESCAPE CHARACTER
18	AC0B	F2SDRV	EQU	X'AC0B' SYSTEM DRIVE NUMBER
19	AC0C	F2MDRV	EQU	X'AC0C' WORKING DRIVE
20	AC0E	F2SDR	EQU	X'AC0E' 3 BYTE DATE REGISTER
21	AC11	F2LAST	EQU	X'AC11' LAST TERMINATOR

ecution of FD. The left-most column is a relative offset address within the file. This is followed by 16 bytes of data displayed in ASCII. Any nonprintable character is replaced by a question mark (?).

Listing 2 is FD assembled from FLEX 2.0. It was assembled using RRMAC from Ed Smith's Software Works. The significant difference between the RRMAC format and Motorola assembler format is in the formation of constants. For example, the constant hexadecimal 1234 is represented by X'1234' instead of \$1234. The object code generated by RRMAC is relocatable—in other words, it can be loaded anywhere in memory.

This relocation is performed by another Ed Smith program called a loader. For those who wish to use standard Motorola assembler format, the directive `ORG $A100` should be added after line 134, and the constants should be changed back to the Motorola format.

Lines 6 through 133 have been included from another file. These lines are a set of equates for all the FLEX interfaces that I feel I might use.

Although most of these equates are never used in FD, it ensures that all of my programs use the same names for the FLEX interfaces. This way, if TSC releases a new version of FLEX with some of the entry points changed, I will only have to change the include file and then reassemble all my routines.

Lines 135 through 150 open the file that is to be dumped. `GETBLK` (line 151) is the start of the processing loop. This routine gets characters from the file and checks for a read error. `DLINES` (line 165) is the beginning of the routine that prints the data. Routine `DONE` (line 212) closes the file and returns to FLEX at its warm-start entry.

If an I/O error occurs, the routine `FIL.ERR` will report the error, close any open files and return to FLEX. Note that FD has no way to determine where the last piece of meaningful data is located in the file; therefore, a normal termination is the message `READ PAST END OF FILE.` ■

22	AC12	F2UCTA	EQU	X'AC12'	USER COMMAND TABLE ADDRESS
23	AC14	F2LBP	EQU	X'AC14'	LINE BUFFER POINTER
24	AC16	F2ERR	EQU	X'AC16'	ESCAPE RETURN REGISTER
25	AC18	F2CURC	EQU	X'AC18'	CURRENT CHARACTER
26	AC19	F2PREC	EQU	X'AC19'	PREVIOUS CHARACTER
27	AC1A	F2LINE	EQU	X'AC1A'	CURRENT LINE NUMBER
28	AC1B	F2LDA0	EQU	X'AC1B'	LOADER ADDRESS OFFSET
29	AC1D	F2TRAN	EQU	X'AC1D'	TRANSFER FLAG
30	AC1E	F2TRNA	EQU	X'AC1E'	TRANSFER ADDRESS
31	AC20	F2ERRT	EQU	X'AC20'	ERROR TYPE
32	AC21	F2SIOF	EQU	X'AC21'	SPECIAL I/O FLAG
33	AC22	F2OTSW	EQU	X'AC22'	OUTPUT SWITCH
34	AC23	F2INSW	EQU	X'AC23'	INPUT SWITCH
35	AC24	F2FOA	EQU	X'AC24'	FILE OUTPUT ADDRESS
36	AC26	F2FIA	EQU	X'AC26'	FILE INPUT ADDRESS
37	AC28	F2COMF	EQU	X'AC28'	COMMAND FLAG
38	AC29	F2CCOL	EQU	X'AC29'	CURRENT OUTPUT COLUMN
39	AC2B	F2MEND	EQU	X'AC2B'	MEMORY END
40	AC2D	F2ENV	EQU	X'AC2D'	ERROR NAME VECTOR
41	AC2F	F2FIEF	EQU	X'AC2F'	FILE INPUT ECHO FLAG
42		*			
43		* FLEX SUBROUTINES			
44		*			
45	AD00	COLD5	EQU	X'AD00'	COLDSTART ENTRY
46	AD03	WARMS	EQU	X'AD03'	WARM START ENTRY
47	AD06	RENTER	EQU	X'AD06'	MAIN LOOP RE-ENTRY
48	AD09	INCH	EQU	X'AD09'	INPUT CHAR
49	AD0C	INCH2	EQU	X'AD0C'	INPUT CHAR
50	AD0F	OUTCH	EQU	X'AD0F'	OUTPUT CHAR
51	AD12	OUTCH2	EQU	X'AD12'	OUTPUT CHAR
52	AD15	GETCHR	EQU	X'AD15'	PREFERRED GET CHAR
53	AD18	PUTCHR	EQU	X'AD18'	PREFERRED PUT CHAR
54	AD1B	INBUFF	EQU	X'AD1B'	INPUT TO LINE BUFFER
55	AD1E	PSTRNG	EQU	X'AD1E'	PRINT STRING
56	AD21	CLASSF	EQU	X'AD21'	CLASSIFY CHARACTER
57	AD24	PCRLF	EQU	X'AD24'	PRINT CR, LF
58	AD27	NXTCH	EQU	X'AD27'	NEXT CHARACTER
59	AD2A	RSTRIO	EQU	X'AD2A'	RESTORE I/O VECTORS
60	AD2D	GETFIL	EQU	X'AD2D'	PARSE FILE SPEC.
61	AD30	LOAD	EQU	X'AD30'	FILE LOADER
62	AD33	SETEXT	EQU	X'AD33'	SET EXTENSION
63	AD36	ADDBX	EQU	X'AD36'	ADD ACC-B TO X
64	AD39	OUTDEC	EQU	X'AD39'	OUTPUT DECIMAL NUMBER
65	AD3C	OUTHEX	EQU	X'AD3C'	OUTPUT HEX CHARACTER
66	AD3F	RPTERR	EQU	X'AD3F'	REPORT ERROR
67	AD42	GETHEX	EQU	X'AD42'	GET HEX NUMBER
68	AD45	OUTADR	EQU	X'AD45'	OUTPUT HEX ADDRESS
69	AD48	INDEC	EQU	X'AD48'	INPUT DECIMAL NUMBER
70	AD4B	DOCMND	EQU	X'AD4B'	CALL DOS
71	B400	FMINIT	EQU	X'B400'	FMS INITIALIZATION
72	B403	FMSCLS	EQU	X'B403'	FMS CLOSE
73	B406	FMS	EQU	X'B406'	FMS CALL
74		*			
75		* FMS COMMANDS			
76		*			
77	0000	FL2IO	EQU	X'0'	READ/WRITE NEXT BYTE
78	0001	FM2OPR	EQU	X'1'	OPEN FOR READ
79	0002	FM2OPW	EQU	X'2'	OPEN FOR WRITE
80	0003	FM2OPU	EQU	X'3'	OPEN FOR UPDATE
81	0004	FM2CLF	EQU	X'4'	CLOSE FILE
82	0005	FM2RWF	EQU	X'5'	REWIND FILE
83	0006	FM2OPD	EQU	X'6'	OPEN DIRECTORY
84	0007	FM2GIR	EQU	X'7'	GET INFORMATION RECORD
85	0008	FM2PIR	EQU	X'8'	PUT INFORMATION RECORD
86	0009	FM2RSS	EQU	X'9'	READ SINGLE SECTOR
87	000A	FM2WSS	EQU	X'A'	WRITE SINGLE SECTOR
88	000C	FM2DLF	EQU	X'C'	DELETE FILE
89	000D	FM2RNF	EQU	X'D'	RENAME FILE
90	000F	FM2NSS	EQU	X'F'	NEXT SEQUENTIAL SECTOR
91	0010	FM2OSI	EQU	X'10'	OPEN SYSTEM INFORMATION RECORD
92	0011	FM2GRB	EQU	X'11'	GET RANDOM BYTE FROM SECTOR
93	0012	FM2PRB	EQU	X'12'	PUT RANDOM BYTE IN SECTOR OR
94	0014	FM2FND	EQU	X'14'	FIND NEXT DRIVE
95	0015	FM2POS	EQU	X'15'	POSITION BY RECORD
96	0016	FM2BOR	EQU	X'16'	BACKUP 1 RECORD
97		*			
98		* FILE CONTROL BLOCK SEPCIFICATIONS			
99		*			
100	0000	FB2FNC	EQU	0	FMS COMMAND
101	0001	FB2ESB	EQU	1	ERROR STATUS
102	0002	FB2ACT	EQU	2	ACTIVITY STATUS
103	0003	FB2DRV	EQU	3	DRIVE NUMBER
104	0004	FB2NAM	EQU	4	FILE NAME (8 BYTES)
105	000C	FB2EXT	EQU	12	EXTENSION (3 BYTES)
106	000F	FB2PAT	EQU	15	FILE ATTRIBUTES
107	0011	FB2SDA	EQU	17	STARTING DISK ADDRESS
108	0013	FB2EDA	EQU	19	ENDING DISK ADDRESS
109	0015	FB2SIZ	EQU	21	FILE SIZE
110	0017	FB2SHI	EQU	23	FILE SECTOR MAP INDICATOR
111	001C	FB2FLP	EQU	28	FCB LIST POINTER
112	001E	FB2CUR	EQU	30	CURRENT POSITION
113	0022	FB2INX	EQU	34	DATA INDEX
114	0023	FB2RDX	EQU	35	RANDOM INDEX
115	0024	FB2NWB	EQU	36	NAME WORK BUFFER
116	002F	FB2CDA	EQU	47	CURRENT DIRECTORY ADDRESS
117	0032	FB2FDP	EQU	50	FIRST DELETED DIRECTORY POINTER
118	003B	FB2SCF	EQU	59	SPACE COMPRESSION FLAG
119	0040	FB2BUF	EQU	64	SECTOR BUFFER
120		*			
121		* FILE EXTENSIONS			
122	0000	FEXT.BIN	EQU	0	
123	0001	FEXT.TXT	EQU	1	
124	0002	FEXT.CMD	EQU	2	
125	0003	FEXT.BAS	EQU	3	
126	0004	FEXT.SYS	EQU	4	
127	0005	FEXT.BAK	EQU	5	
128	0006	FEXT.SCR	EQU	6	
129	0007	FEXT.DAT	EQU	7	
130	0008	FEXT.BAC	EQU	8	
131	0009	FEXT.DIR	EQU	9	
132	000A	FEXT.PRT	EQU	10	
133	000B	FEXT.OUT	EQU	11	

134	135	136	137	138	139	140	141	142	143	144	145	146	147	148	149	150	151	152	153	154	155	156	157	158	159	160	161	162	163	164	165	166	167	168	169	170	171	172	173	174	175	176	177	178	179	180	181	182	183	184	185	186	187	188	189	190	191	192	193	194	195	196	197	198	199	200	201	202	203	204	205	206	207	208	209	210	211	212	213	214	215	216	217	218	219	220	221	222	223	224	225	226	227	228	229	230	231	232	233	234	235	236	237	238	239	240	241	242	243	244	245	246	247	248	249	250	251	252	253	254	255	256	257	258	259	260	261	262	263	264	265	266	267	268	269	270	271	272	273	274	275	276	277	278	279	280	281	282	283	284	285	286	287	288	289	290	291	292	293	294	295	296	297	298	299	300	301	302	303	304	305	306	307	308	309	310	311	312	313	314	315	316	317	318	319	320	321	322	323	324	325	326	327	328	329	330	331	332	333	334	335	336	337	338	339	340	341	342	343	344	345	346	347	348	349	350	351	352	353	354	355	356	357	358	359	360	361	362	363	364	365	366	367	368	369	370	371	372	373	374	375	376	377	378	379	380	381	382	383	384	385	386	387	388	389	390	391	392	393	394	395	396	397	398	399	400	401	402	403	404	405	406	407	408	409	410	411	412	413	414	415	416	417	418	419	420	421	422	423	424	425	426	427	428	429	430	431	432	433	434	435	436	437	438	439	440	441	442	443	444	445	446	447	448	449	450	451	452	453	454	455	456	457	458	459	460	461	462	463	464	465	466	467	468	469	470	471	472	473	474	475	476	477	478	479	480	481	482	483	484	485	486	487	488	489	490	491	492	493	494	495	496	497	498	499	500	501	502	503	504	505	506	507	508	509	510	511	512	513	514	515	516	517	518	519	520	521	522	523	524	525	526	527	528	529	530	531	532	533	534	535	536	537	538	539	540	541	542	543	544	545	546	547	548	549	550	551	552	553	554	555	556	557	558	559	560	561	562	563	564	565	566	567	568	569	570	571	572	573	574	575	576	577	578	579	580	581	582	583	584	585	586	587	588	589	590	591	592	593	594	595	596	597	598	599	600	601	602	603	604	605	606	607	608	609	610	611	612	613	614	615	616	617	618	619	620	621	622	623	624	625	626	627	628	629	630	631	632	633	634	635	636	637	638	639	640	641	642	643	644	645	646	647	648	649	650	651	652	653	654	655	656	657	658	659	660	661	662	663	664	665	666	667	668	669	670	671	672	673	674	675	676	677	678	679	680	681	682	683	684	685	686	687	688	689	690	691	692	693	694	695	696	697	698	699	700	701	702	703	704	705	706	707	708	709	710	711	712	713	714	715	716	717	718	719	720	721	722	723	724	725	726	727	728	729	730	731	732	733	734	735	736	737	738	739	740	741	742	743	744	745	746	747	748	749	750	751	752	753	754	755	756	757	758	759	760	761	762	763	764	765	766	767	768	769	770	771	772	773	774	775	776	777	778	779	780	781	782	783	784	785	786	787	788	789	790	791	792	793	794	795	796	797	798	799	800	801	802	803	804	805	806	807	808	809	810	811	812	813	814	815	816	817	818	819	820	821	822	823	824	825	826	827	828	829	830	831	832	833	834	835	836	837	838	839	840	841	842	843	844	845	846	847	848	849	850	851	852	853	854	855	856	857	858	859	860	861	862	863	864	865	866	867	868	869	870	871	872	873	874	875	876	877	878	879	880	881	882	883	884	885	886	887	888	889	890	891	892	893	894	895	896	897	898	899	900	901	902	903	904	905	906	907	908	909	910	911	912	913	914	915	916	917	918	919	920	921	922	923	924	925	926	927	928	929	930	931	932	933	934	935	936	937	938	939	940	941	942	943	944	945	946	947	948	949	950	951	952	953	954	955	956	957	958	959	960	961	962	963	964	965	966	967	968	969	970	971	972	973	974	975	976	977	978	979	980	981	982	983	984	985	986	987	988	989	990	991	992	993	994	995	996	997	998	999	1000
3R	0000	CE	0000																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																															

000B FEXT,BAC	130			
0005 FEXT,BAK	127			
0003 FEXT,BAS	125			
0000 FEXT,BIN	122			
0002 FEXT,CMD	124			
0007 FEXT,DAT	129			
0009 FEXT,DIR	131			
000B FEXT,OUT	133			
000A FEXT,PRT	132			
0006 FEXT,SCR	128			
0004 FEXT,SYS	126			
0001 FEXT,TXT	123	141		
00BC FIL,ERR	219	147	210	217
001F FIL,ERR	147	140		
0000 FL2ID	77			
0016 FM2BOR	96			
0004 FM2CLF	81	213		
000C FM2DLF	88			
0014 FM2FND	94			
0007 FM2GIR	84			
0011 FM2GRB	92			
000F FM2NSS	90			
0006 FM2OPD	83			
0001 FM2OPR	78	143		
0003 FM2OPU	80			
0002 FM2OPW	79			
0010 FM2OSI	91			
0008 FM2PIR	85			
0015 FM2POS	95			
0012 FM2PRB	93			
000D FM2RNF	89			
0009 FM2RSS	86			
0005 FM2RWF	82			
000A FM2WSS	87			
B400 FINIT	71			
B406 FMS	73	145	157	216

B403 FMSCLS	72	222			
0029 GETBLK	151	211			
AD15 GETCHR	52				
AD2D GETFIL	60	139			
AD42 GETHEX	67				
002E GETNXT	154	164			
009B GOODH	204	202			
003C GOTONE	160	158			
AD1B INBUFF	54				
AD09 INCH	48				
AD0C INCH2	49				
AD48 INDEC	69				
021D LAST	231				
AD30 LOAD	61				
AD27 NXTCH	58				
AD45 OUTADR	68	166			
AD0F OUTCH	50				
AD12 OUTCH2	51				
AD39 OUTDEC	64				
AD3C OUTHEX	65	177			
0022 OVER	148	146			
AD24 PCRLF	57	150	208		
00C9 POSDMP	226	136	165	167	170
AD1E PSTRNG	55				
AD18 PUTCHR	53	172	179	184	191 204
0099 QMARK	203	200			
AD06 RENTER	47				
00C8 RESCNT	225	137	159	175	185 196 209
AD3F RPTERR	66	221			
AD2A RSTRIO	59				
AD33 SETEXT	62	142			
000D START	135	232			
AD03 WARMS	46	218	223		
0065 XLODP	177	182			

Ohio Scientific!

HARDWARE: CIP VIDEO—Gives true 32 or 64 chr/line with guard bands. This is not a make-shift mod. It makes your video every bit as good as the 4P's plus you have switch selectable 1, 2 and 3 MHz CPU clock as well as 300, 600 and 1200 baud for cassette and serial port—all crystal controlled. Send for our \$100 catalog for more details. Complete plans—\$18.95 Kit—\$39.95 or send your 600 board to: Rick Lotoczky,

3281 Countryside Cir.
Pontiac Twp, MI 48057

and he will install the video mod for \$79.95.

Other mods available: Add sound, RS-232 port, cassette motor control, cassette interface plans (300, 600 & 1200 baud)

SOFTWARE: (With documentation) For C1, C2, 4P & 8P Chess 1.9, Backgammon, Excellent card games; Arcade type games, Utility Programs, Mini Word Processor, Memory Maps; Editing Cursor etc.

Catalog with free program (hard copy) and Memory Map for BASIC in ROM Models \$1.00

✓ 202

Progressive Computing

3336 AVONDALE CT.,
WINDSOR, ONT.
CANADA N9E 1X6
(519)969-2500

OSI IP PROGRAMS AND MORE NEW PROGRAMS

1008 RENUMBER 4.95

THIS RENUMBERING PROGRAM WRITTEN IN BASIC INCLUDES SOME ERROR DETECTION. IT WILL RUN ON ANY OSI IP. INCLUDES DOCUMENTATION WITH LISTING AND TAPE. COPY OF DOCUMENTATION ONLY: \$2.00

1007 INVENTORY SLS 14.95

REQUIRING AT LEAST AN 8K IP THIS INVENTORY/SALES SYSTEM IS SUPPORTED WITH CASSETTE FILES AND INCLUDES REPORTS GENERATION. INCLUDES DOCUMENTATION WITH LISTING AND TAPES. DOCUMENTATION ONLY: \$3.00

MORE

106 6502 REFERENCE CARD 2.00

THIS HANDY CARD WILL PROVIDE ALMOST ALL THE INFORMATION NEEDED BY NOVICES AND EXPERTS WHILE PROGRAMMING THE 6502. IT SHOULD PAY FOR ITSELF MANY TIMES OVER FROM TIME SAVED THROUGH ITS USE.

ALL THE ABOVE ITEMS INCLUDE FIRST CLASS POSTAGE AND HANDLING CHARGES FOR A COMPLETE PRICE LIST SEND \$5.00 FOR PM

BILLS MICRO SERVICES

210 S. KENILWORTH, OAK PARK, ILL. 60302 DEPT: KM-N

MAIL ORDER ONLY
FOREIGN ORDERS PLEASE REMIT U.S. FUNDS.
ILL. RESIDENTS ADD 6% SALES TAX

✓ 211

HOMES for the TRS-80

Featuring

High Quality, Commercial, and Economy Models.
Computer Consoles for \$129.95.
Printer Stands \$39.95.
Complete TRS-80 Business System, built-in.



Custom furniture for the TRS-80 office or home decor.
—FOR 24 HOUR INFORMATION—
PHONE 408-946-1265

AVS AUDIO-VIDEO 2485 AUTUMNVILLE AVE.
SYSTEMS SAN JOSE, CA. 95132
Dealer inquiries invited.

✓ 192

Hardware Debug Aid



The New Technologies Co. introduces their Hardware Debug Aid, an \$100 board that offers the technician or hobbyist an inexpensive alternative to a logic analyzer when troubleshooting microcomputers. The HDA(\$100) features the ability to provide a pulse to sync an oscilloscope on any specific instruction or portion of instruction. If the technician desires, the address buss may be disconnected so as to sync on any combination of up to 17 signals by using jumpers. The sync pulse also is used to latch and display on LED's the qualified status of up to 8 TTL level signals. Price is \$99.95.

New Technologies Co.

P.O. Box 32
Streamwood, IL. 60103
Tel. (312) 289-4410

✓ 265

INVESTMENT DATA SYSTEM for the APPLE II

At last! CREATE A COMPLETE DIGITAL DATA BASE in minutes for any stock or commodity. Months or even years of charted data can be traced from a graphics tablet using the INVESTMENT DATA SYSTEM. After files are created to your specifications, they can be easily updated and displayed at any time.

The data bases may be created on a daily, weekly or monthly basis and analyzed in your own programs or other commercially available software.

The INVESTMENT DATA SYSTEM is written for the APPLE II computer. At least one disk drive, Applesoft in ROM, a minimum of 32K RAM and a Talos¹ or Apple¹ graphics tablet are required.

Data System & Manual	\$120 ²
Manual Alone	\$ 20 ²
Further Information	No Charge

URBAN AGGREGATES INC.
6431 Brass Knob
Columbia, Maryland 21044

✓ 325

1 Specify which
2 Maryland Residents, add 5% Sales Tax

BASEX is . . .

- More Basic than BASIC!
- More Forthright than FORTH!
- More Tiny than TINY C!
- Runs Fast like FORTRAN!
- Less Hascal than PASCAL!

*97 page manual (\$8) with complete source listing.

*TAPES (\$25) — Meca, SOL, Poly88, TRS80 (16K/II), Paper tape, Exidy.

*DISKS — NStar (\$25); CPM (\$35) 8" SD or 5" (NStar, Meca, Micropil).

ADD \$.75 shipping (\$1.50 UPS or special handling)



INTERACTIVE MICROWARE, INC
Box 771, State College, PA, 16801

CALL (814) 238-8294 ✓ 218

Breakout Box

Accessing an extra parallel I/O port is easy with this simple hardware project.

Don Walters
2849 Verle St.
Ann Arbor, MI 48104

It was inevitable that microcomputers would find their way into the ham shack, as the two hobbies overlap. Although most of the microcomputers will perform dedicated functions such as CW, RTTY, antenna aiming for satellite work and slow-

scan TV, a few will end up with an extra parallel I/O port or two. The spare I/O port will tempt its owner to experiment with bit pushing and pulling in many projects.

Every new technology brings new needs and problems with it. Such is the case with the microcomputer and its spare parallel I/O port. The problem is how are you going to get at the bits and signals on it. Just run wires out near where you need them, right?

Photo 1 demonstrates that this method works. However, a few weeks of working with it this way will quickly change your mind about how nice the method really isn't. It won't be long before you decide that there must be a better way to access the bits and signals of the parallel I/O port.

A Better Way

While watching a potential vendor use a breakout box to

make his printer work with our minicomputer-based word-processing system, I realized that this technique could be applied to a parallel I/O port as well. This would allow quick accessing of the bits and signals of the parallel I/O port of my Imsai 8080.

I thought about how I could set up such a convenience and worked the whole thing out. By the end of the evening I had put the parallel I/O breakout panel together, and had it debugged.

Photo 2 shows the result of my efforts. Also note in the photograph the use of a standard connector plug for connecting the breakout panel to the parallel I/O port connectors on the back of my Imsai 8080. The constant use of standard connectors on my system has saved me many headaches over the past couple years.

Construction

The breakout panel is simple to build and should take about an evening to put together. Your total cost will be about \$15. Fig. 1 gives the general construction details on how to build the breakout panel.

The first step is to cut a piece of aluminum or hardboard to the size you want your breakout panel to be. If you want to duplicate my breakout panel use the dimensions given in Fig. 1.

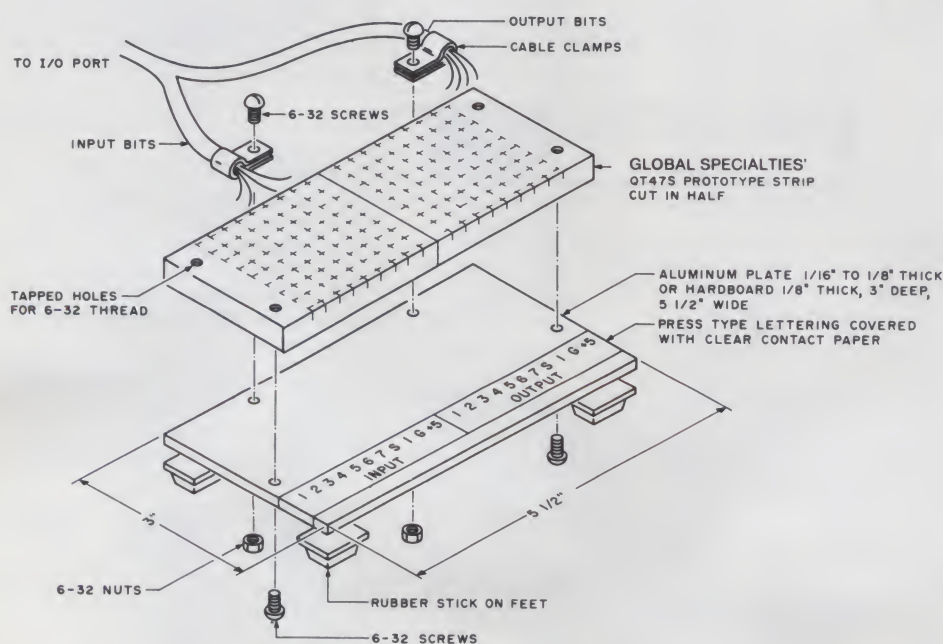


Fig. 1. General construction details for the breakout panel.

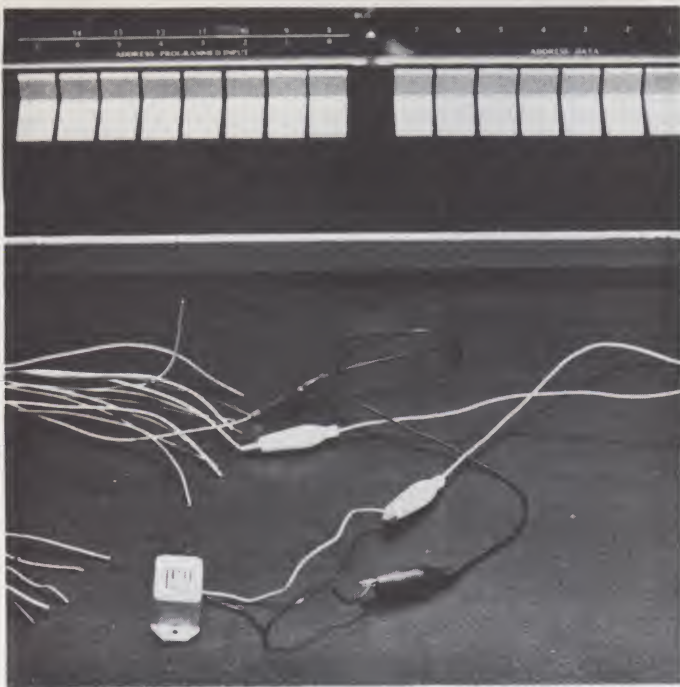


Photo 1. Cumbersome array of loose wires coming from a parallel I/O port with a solid-state buzzer precariously attached to one of the output bits (I think).

The hardest step is to cut the Global Specialties' QT47S or equivalent prototype strip (available from several of the mail-order houses that advertise in *Microcomputing*, as well as from Radio Shack and possibly local electronics outlets in your area) in two, lengthwise. You want to separate the two halves of the prototype strip so that you end up with two half-strips.

The prototype strip is made of soft plastic and can be cut with a heavy knife. Exercise care in cutting and make several passes over the same cut before you cut through the prototype strip's center. Alternately, you can use a small hobby-type hacksaw to cut the protostrip in two.

Lay half of the prototype strip and the cable clamps on the base and mark where you will have to drill their mounting holes. Use presstype lettering to label the holes of the prototype strip as to which bit or signal is available at that point on the prototype strip. Photo 3 shows how I labeled the various holes on the prototype strip. Cover the lettering with a strip of clear contact paper to protect it.

Assemble all the parts onto

the base using six to 32 machine screws and nuts. The easy way to mount the prototype strip is to tap the holes on either end with a 6-32 tap. Remember to leave the cable clamps a little loose, since they will not be tightened until all the wires have been attached to the prototype strip.

After all the components are mounted to the base, attach the rubber feet.

The last step is to attach the wires coming from the parallel I/O port to the modified prototype strip. Number 24 stranded wire is about the right size. Cut about a quarter of an inch of insulation from the end of each wire, then twist the wire tightly together. Tin each wire with a little solder and insert each wire into its hole in the prototype strip.

Tighten the cable clamp screws so they provide strain relief for the wire bundle going to the parallel I/O port. Make sure the various wires, attached to the prototype strip and labeled as to their bit or signal, actually carry that bit or signal from the parallel I/O port.

That's all there is to building this simple project. ■

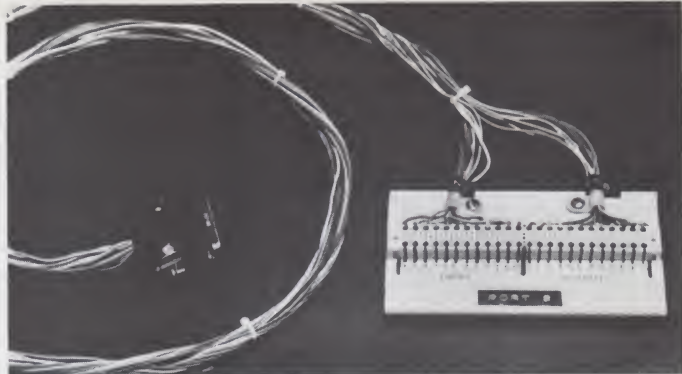


Photo 2. Breakout panel that allows easy access and connection to the various signals of the parallel I/O port. The labeling of the signals on the panel speeds up connection of projects or experiments, since I don't have to look up what each wire is. Also, you should note the connector used at the other end, which makes the breakout panel more useful since it can be used to check out any other parallel port or, for that matter, a serial port. In my case, I standardized on the DB-25 series of connectors for both RS-232 and parallel I/O. That decision three years ago has saved me many headaches ever since.

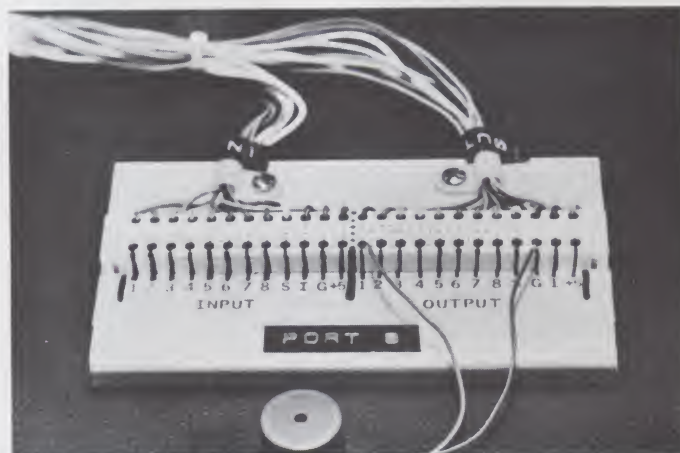


Photo 3. A close-up look at how easy it is to hook into single bits of an I/O port. Note how cleaner and easier it is to hook up a solid-state buzzer in this photo than it was in Photo 1.

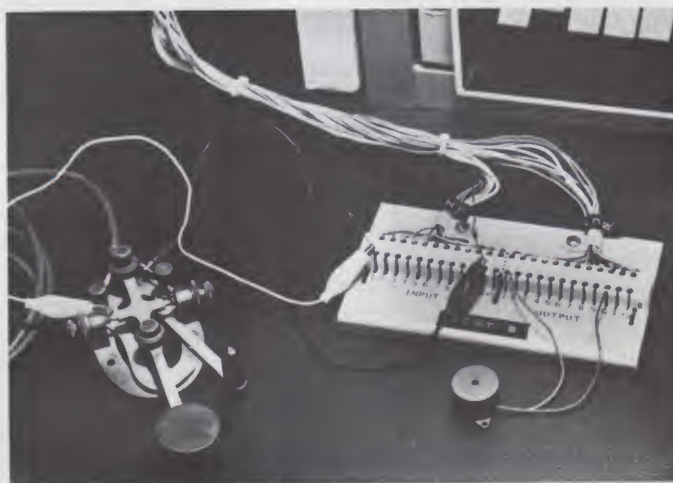


Photo 4. Close-up view of an expensive code practice oscillator? Well, not really. I was using this setup to debug a simple CW to CRT display program running on my Imsai 8080 in the background.

**Forgot to renew?
Need a gift in a hurry?
Want to order a book?**

**Remedy the situation
immediately at our expense.
Call us toll-free and let us help you.**

{800} 258-5473

Microfilm copies of Kilobaud Microcomputing are available and may be purchased from University Microfilms, a Xerox company, 300 N. Zeeb Rd., Ann Arbor MI 48106.



MACO MICRO MODULE ... TRS-80 USERS ...

Expand the horizons of your Level II R-S system with the M3 Interactive Interface.

HARDWARE FEATURES:

- Two 8-bit hand-controller input ports.
- 1/10 second interrupt generator for use as a timer or Real-Time clock.
- Audio generator with speaker.
- Connects to expansion connector with provided cable.
- Self-contained power supply.
- Presents only one LSTTL load on the TRS-80 Bus.

SOFTWARE FEATURES:

- Software package includes:
TRS-80 Brickyard Micro-Organ
Real-Time Clock Comput-a-Sketch
- Complete programming instructions for BASIC and Assembly Language provided.

All M3 units are factory burnt in and CPU tested. Please specify memory size when ordering. Dealer inquiries are invited. ... **PRICE: \$129.95.**

Ordering: Money Order or Check—we pay freight charges. VISA, MC, or C.O.D.—freight added to bill. On charge cards please include complete number as well as your complete address.

MACO MANUFACTURING

1383 Airways Blvd. • Memphis, Tenn. 38114
Telephone (901) 452-9510 ✓ 234

"TRS-80" is a trademark of Tandy Corp.

— Professional —

Real Estate Programs

available on cassette or diskette
for Apple & TRS-80 II

Property Management System

- Rental Income Tracking
- Complete Expense Analysis

System w/Manual \$225.00
Manual \$15.00

Program Modules:

- 1) Home Purchase Analysis
- 2) Income Property Cashflow/Leverage
- 3) Construction Cost/Profit
- 4) Tax Deferred Exchange
- 5) APR Loan Analysis

Price Per Module \$35
Add \$5.00 for Programs
on Diskette



At Computer Stores
everywhere or call
(213) 372-9419
for C.O.D. ✓ 117

2045 Manhattan Ave., Hermosa Beach, CA 90254

EXIDY Sorcerer 16K \$1,089+ commodore Pet 16K \$799+

Call or write for price list with comparable savings on 32/48K models and peripherals. ✓ 260



MicroComputer
Warehouse

3620 La Habra Way
Sacramento, Ca. 95825
(916) 486-3678

- Computers are fully tested and burned in for 48 hours.
- We respond promptly to all inquiries and orders. Send \$1 for catalog, refundable with order.
- ♦ Cash price—add 2% for Visa/Mastercharge. Price subject to change without notice.

C-10 SHORT CASSETTES 50 FT.

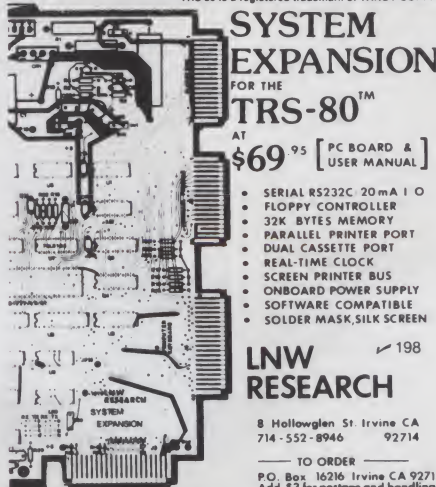


Qty.	Price
10	\$0.75
50	\$0.65

Premium tape and cassettes acclaimed by thousands of repeat order microcomputer users. Price includes labels, cassette box and shipping in U.S.A. VISA and M/C orders accepted. California residents add sales tax. Phone (415) 968-1604. ✓ 123

MICROSETTE CO.
475 Ellis Street
Mt. View, CA 94043

TRS-80 is a registered trademark of TANDY CORP.



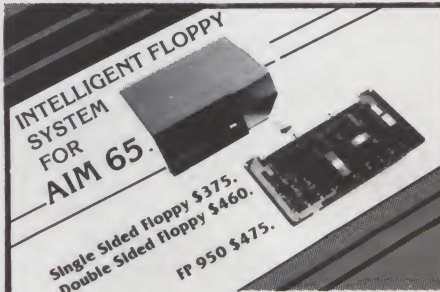
SYSTEM EXPANSION FOR THE TRS-80™ AT \$69.95 [PC BOARD & USER MANUAL]

- SERIAL RS232C 20 mA 1 O
- FLOPPY CONTROLLER
- 32K BYTES MEMORY
- PARALLEL PRINTER PORT
- DUAL CASSETTE PORT
- REAL-TIME CLOCK
- SCREEN PRINTER BUS
- ONBOARD POWER SUPPLY
- SOFTWARE COMPATIBLE
- SOLDER MASK, SILK SCREEN

LNW RESEARCH ✓ 198

8 Hollowglen St. Irvine CA 92714
714-552-8946

TO ORDER
P.O. Box 16216 Irvine CA 92713
Add \$3 for postage and handling.
CA residents add 6% sales tax.
Master Charge & VISA orders now accepted



INTELLIGENT FLOPPY SYSTEM FOR AIM 65.

Single Sided Floppy \$375.
Double Sided Floppy \$460.
FP 950 \$475.

- 6.0" x 9.75" PCB for AIM65 motherboard
- 5 volts only
- 35, 40 or 77 track/side
- 4 single/double sided drives, 8 heads.
- Motor on/off for 4 drives.
- Single or double density under software control.
- Powerful ADOS have all necessary commands and file management full interface to AIM65 editor, assembler, basic, and monitor.
- Dynamic allocation of files.
- Buffered sector or block transfer modes for fast access.
- Allows interface to an 80 or 135 column printer

Applied Business Computer Company
707 S. State College Blvd., Suite G ✓ 334
Fullerton, California 92631 Tel. (714) 871-1411
Note: Phone # in June ad was incorrect.

Please dial # shown above.

DISK DRIVE/CAT ★SALE★

Shugart
SA801R
for
RS MOD. II
ONLY

\$485

Hazeltine 1000 (unused).....\$499
Shugart SA400.....\$279
Percoc FD200.....\$279—FD250.....\$359
MPI B51.....\$279—B52.....\$349
SA801R w/PS/Cab.....\$750
Dual Drives w/PS/Cab.....\$1640

LIMITED QUANTITIES

MTI 3304 W. MacArthur Blvd.
Santa Ana, CA 92704
(714) 979-9923 ✓ 219



**COMPUTER
ACTION** ✓ 183

Send for our
FREE PRICELIST
with very low prices
on disks, tapes, and
many other items for
**COMPUTER HOBBYISTS
AND BUSINESS USERS**

Send name & addr. to
Computer Action
P.O. Box 119
Brooklyn, N.Y. 11236

IEEE 488 & RS232 Switching Units



GRS232 units are ideal for interfacing and monitoring various peripherals with computers, modems and printers. The GRS232 units allow the sharing of a line printer between two or three CPU's or terminals. All GRS232 units are bi-directional.

*GRS232-S8 switches 8 pins (2, 3, 4, 5, 6, 8, 17, 20)

*GRS232-S24 switches 24 pins (2-25)

*GRS232-P24 switches 24 pins (1-24)

*All connectors are standard 25 pin EIA type

*Cascading option (GRS232-2S24 & -2P24, allows inter-
facing of more than 5 devices)

*Standard size 10.0" x 7.0" x 3.0"

*High reliability—3 year warranty

Inquire about optional monitoring capabilities. IEEE
488 bus & RS232 interface cables are a stock item.

\$129.00 single units
Quantity discounts available

Delivery in 3-4 weeks if not
available from stock.



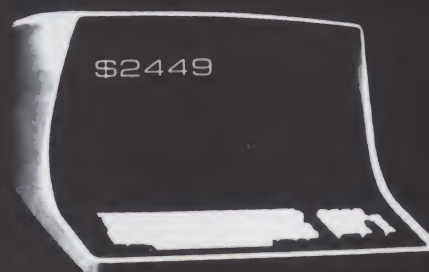
ORDER FROM:
Giltronix, Inc.

450 San Antonio Ave.
Suite 44 ✓ 188
Palo Alto, CA 94306
415-493-1300 / 493-2199

**ΩMEGA
SALES
CO.**

**"WHOLESALE COMPUTER PRICES"
DIRECT TO THE PUBLIC**
12 Meeting St., Cumberland, R.I. 02864

**PRODUCT SPECIAL
OF THE MONTH!!**



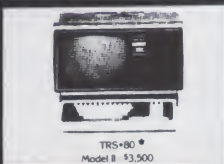
\$2449

INTERTEC SUPERBRAIN

32K RAM - \$2449.00

64K RAM - \$2649.00

(Prices valid July 15 - Sept. 1, 1980)



TRS-80
Model II 93,500



Apple II
16K 91,049



NEC Spinwriter
5510-5530 92,449

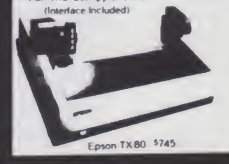
Products are
**NOW
IN
STOCK
AT
ΩMEGA
Sales
Co.**



Soroc 120 96,999



Atan 800 97,499



Epson TX80 97,499

CALL TOLL FREE FOR ΩMEGA'S PRICE!

ΩMEGA OFFERS THE BEST DELIVERY AND PRICE ON:

APPLE • ATARI • TRS-80 MODEL II • INTERTEC •

T.I. 810 • HEWLETT-PACKARD-85 • SOROC •

COMMODORE • NEC • QUME • CENTRONICS

ΩMEGA sells only factory fresh, top quality merchandise to our customers.

ΩMEGA will try to match any current advertised price with similar purchase conditions.

Before you buy anywhere else - be sure to call ΩMEGA Sales Co.

1-401-722-1027 or

ΩMEGA ✓ 89

TOLL FREE 1-800-556-7587

ΩMEGA ships via UPS, truck, or air. COD's, VISA, Mastercharge accepted.

"A member in good standing of the better business bureau."



BASIC Programming Tips

Don't sacrifice efficiency for faster program development.

Alfred E. Williams
1551 Oceanair Dr.
San Luis Obispo, CA 93401

Most microcomputer BASIC programmers eventually run into applications that require faster execution speed or less memory to be practical. The trend in the computer industry is to favor faster development of more reliable and maintainable programs at the expense of efficiency, except in time-critical applications. With a little thought, the programmer can develop some techniques to promote execution efficiency without affecting the speed or clarity of his programming.

The goals of reducing required memory and increasing execution speed often conflict. For example, the simple bubble sort needs minimum storage in addition to the input-output array, but is very time-consuming. More sophisticated sorts (e.g., Shell sort) execute many times faster but require more storage. I'll focus on tips to improve execution speed.

There are many different implementations of BASIC—integer or floating-point, compiler or interpreter—with varying degrees of efficiency. If you're lucky enough to have a choice of software for your micro, shop around. If efficiency is critical for you, you may be better off investing in a commercial, enhanced BASIC interpreter or compiler rather than the one supplied by your machine's

manufacturer. Remember that compilers almost always have a speed advantage over interpreters in actual execution. The requirement for a compile phase may be frustrating, however, if you're used to freely twiddling with your program during debugging.

Consider your choice of storage devices for your program and data files. Generally, *direct access devices* (floppy and hard disks) provide faster retrieval of data than the various kinds of tape devices, particularly when records are to be fetched from random locations in the file rather than in the sequence they were loaded. Unfortunately, the average cost for both disks and drives is higher than the cost for tapes and tape devices, although the appearance of some new, less expensive disk devices recently has provided some hope of an affordable disk for all micro users.

Watch for Critical Inner Loops

The majority of execution time in non-input/output (I/O) bound programs is confined to less than 5 percent of the source text.¹ Donald Knuth, in his writings, points out that program execution speed may largely depend on the speed of one or more short loops. He calls these *critical inner loops*.²

Look for these critical loops in your program, and make sure that all statements in the loop are executed there. For example, if the value of a variable is not changed in a loop, initializing it there will waste execution

time since it will be performed several times instead of once. Execution time may also be saved by doubling up the calculations in a loop. Assume you want to initialize a 40-element array to zero. One way to do this might be:

```
FOR I = 1 TO 40: A(I) = 0: NEXT I
```

Almost half the overhead of the FOR loop, however, could be saved (at a minor expense in memory) by writing the initialization this way:

```
FOR I = 1 TO 20: A(I) = 0: A(I + 20) = 0: NEXT I
```

Sometimes it is beneficial to remove the loop entirely and process using straight-line logic. If your array was four instead of 40 elements, it might have been better to initialize each element of the array individually, rather than use a FOR loop. You must evaluate the trade-off between execution speed, memory and programming ease.

All of the techniques discussed below are especially important in critical inner loops. If you repeat calculations unnecessarily, the loop will multiply its importance many times over a similar error outside the loop.

Repeating Calculations Unnecessarily

Execution efficiency can be improved by setting a variable to the result of a calculation and using that variable rather than repeating the calculation for later testing and computation. Consider the following statement:

```
IF A*B/C - D > 0 THEN E = A*B/C + 1
```

Notice that A and B must be multiplied and divided by C twice. This could be avoided by

replacing the statement by the following:

```
Z = A*B/C: IF Z - D > 0 THEN E = Z + 1
```

Once again, the trade-off is between execution speed, memory and program clarity. Notice that the memory saved in the source text may exceed the memory required to store the new variable if the calculation is complex, depending on the amount of compression your BASIC does in storing the program. You sacrifice program clarity because you use a variable to store an intermediate result, which may make the meaning of the calculation harder to see. Because BASIC allows only one-letter variable names, using a variable this way may also be a luxury you can't afford, but keep the tip in mind for your less complex programs.

Avoid Unnecessary Subscript Calculations

If your BASIC has array variables, you have a technique that, along with FOR loops, allows you to conveniently store and manipulate variable values. Remember, however, that BASIC must spend some time evaluating the subscript and locating the position it points to in the array.

This time is multiplied with multi-subscripted variables. For this reason, it's more efficient to move the value from the subscripted variable to a new unsubscripted variable if the same location in an array is used more than once. Example 1 shows what I recently found in one of my programs. In this case, I asked BASIC to evaluate two

subscripts four times instead of once. Since this occurred in a time-critical inner loop, I saved some time by changing it to Example 2.

Avoid Unnecessary Data Conversions

If your BASIC supports more than one data format, you should find out how these formats are used by BASIC for testing and computation and avoid requiring the computer to convert between them unnecessarily. For example, if fixed-binary numbers are converted to floating point before being tested against, or used in, arithmetic operations with other floating-point numbers, you may want to move the value of a fixed-point variable to a floating-point variable used instead in expressions with other floating-point numbers. Otherwise, your BASIC has to convert the fixed-binary number to floating point every time it occurs in a test or computation with floating-point numbers.

Avoid Unnecessary Transfers of Control

There are many legitimate reasons for using GOSUB in a program; the two most important are for clarity and to use a common section of code without duplication from several different places in the program. Using the GOTO is more controversial, particularly among struc-

tured programming advocates. In any case, transfers of control do require CPU time, and you should avoid bouncing around in your program unless it's necessary.

The *top-down development* approach of structured programming uses subroutines to allow the major functions of the program to be developed first. This leaves development of the detailed processing logic for each functional program block for after the structure and rela-

mistake—is:
100 GOTO 200

200 PRINT "DUMMY, YOU WENT TO THE STATEMENT IMMEDIATELY FOLLOWING THE GOTO")

As you write each GOTO, think whether the routine you're jumping to could be sequentially included instead of inserting the GOTO. If so, do it!

Consider Assembler Subroutines

Finally, if your computer not only has BASIC but also an As-

sembler, or if you are skilled in machine language and your BASIC has an interface, you should consider functions done repeatedly, such as those in critical inner loops, for conversion to Assembler. If properly written, Assembler routines will usually outperform both the BASIC interpreters and compilers. The problem is that Assembler routines are harder to write, debug and maintain than similar rou-

tines in BASIC. For this reason, unless you're a computer freak (I am) or a dedicated masochist, I recommend you consider Assembler primarily for repetitive time-critical functions only. It may seem that the execution time saved by each of these techniques will give a small advantage compared to the extra effort required to write your program. I certainly don't want to suggest that you significantly add to your development time in pursuing small efficiencies. Even so, I think you'll find that if you keep the principles in this article in mind, they will eventually become automatic for you; the overall time savings per program execution could be significant. ■

X1 = CO(A,1) - 30: X2 = CO(A,1) - 5: X3 = CO(A,1) + 5: X4 = CO(A,1) + 30

Example 1.

tionships among the blocks are designed. If you use this approach, sometimes you'll find that some subroutines are called from only one location, and including them in the mainline of the calling block won't seriously affect its clarity. In these cases you should consider eliminating the subroutine and putting its code back into the mainline logic of the caller.

If you're not convinced about structured programming, you're even more likely to have unnecessary GOTOs between sections of your program. (The worst case—lots of inexperienced programmers make this

X1 = CO(A,1) - 30: X2 = X1 + 25: X3 = X1 + 35: X4 = X1 + 60

Example 2.

sembler, or if you are skilled in machine language and your BASIC has an interface, you should consider functions done repeatedly, such as those in critical inner loops, for conversion to Assembler. If properly written, Assembler routines will usually outperform both the BASIC interpreters and compilers. The problem is that Assembler routines are harder to write, debug and maintain than similar rou-

References

1. Dan Ingalls, "The Execution Time Profile as a Programming Tool," *Compiler Optimization*, Second Courant Computer Science Symposium, Prentice-Hall, Englewood Cliffs, NJ, 1972.
2. Donald E. Knuth, "Structured Programming with GOTO Statements," Stanford University Computer Science Department Report STAN-CS-74-416, May 1974.

MORE PROVEN CP/M AND NORTHSTAR SOFTWARE From the Software Review

SOFTWARE MUSIC SYNTHESIS SYSTEM—From California Software, this superb four-voice music synthesizer proves that software can do anything that hardware can do and do it cheaper. Will run old Proc-Tech Music System songs. Available on Northstar Disk, CUTER cassette, and most CP/M formats, includes 10 songs \$79.95
OSBORNE'S BUSINESS PROGRAMS—The complete set (A/R, A/P, G/L, Payroll) is available on most CP/M formats. (Documentation separate) \$100
CREATIVE COMPUTING'S ADVENTURE—The real thing! Re-written for Northstar BASIC. Requires 48K system. Specially licensed from Creative Computing for Software Review customers. On Northstar Diskette \$29.95
FASTGAMMON—The definitive Backgammon game for memory-mapped video systems. Machine coded for extreme speed, requires VDM or Flashwriter-type display. Supplied on Northstar diskette, CUTER cassette and CP/M disk \$29.95
QUICK-REF—Machine coded cross-reference/branch trace for Northstar BASIC programs. Absolutely the best XREF available. Super fast \$21.50
SCAN—Specially licensed to the Software Review, this is the patch that all Northstar Users have been buying. Allows you to selectively list a program by variable or word! A must \$27.50
PALO ALTO TINY BASIC EXTENDED FOR NORTHSTAR—Completely I/O'd to Northstar DOS. Includes documented (and out of print) source code and instructions \$30.00

Order from: Software Review
704 Solano Avenue
Albany, CA 94706
(415)527-7730

✓ 294

PET[®] TRS 80[®] THE SANYO[®] LEEDEx[®]

GREEN SCREEN

• IMPROVE IMAGE CONTRAST
• REDUCE EYE FATIGUE
• ENHANCE SCREEN LEGIBILITY
• PROVIDE A MORE PLEASING DISPLAY
• GIVE A DISTINCTIVE PROFESSIONAL LOOK TO YOUR SYSTEM

The GREEN SCREEN is custom molded to fit nicely over the picture tube. It ingeniously mounts in seconds without any tools. *****

CALL: (212) 296-5916
or send \$12.50 + \$2 S&H

ALPHA product co.
85-71, 79th St., Woodhaven, N.Y. 11421

✓ 249

NEW & IN STOCK NOW

77 TRACK DISK DRIVES \$599.00

5¼ drive with power supply/encl.

— ORDER NOW (1) 800 - 345-8102 —

SUPERBRAIN™

300+K Disk Storage 64 K \$2995.

— ORDER NOW (1) 800 - 345-8102 —

C-ITOH Daisy Wheel Printer

25 cps \$2195. 45 cps \$2795.

SEND FOR FREE CATALOG

V R DATA CORPORATION

777 HENDERSON BOULEVARD

Folcroft Industrial Park

FOLCROFT, PA 19032

Toll Free 1 (800) 345-8102

Our prices are for cash payment terms. Call for other terms.

✓ 64

Program Patching For I/O Flexibility

The author describes a technique for enhancing poorly documented software.

Ken Barbier
Borrego Engineering
PO Box 1253
Borrego Springs, CA 92004

Hey! Did you hear the one about the computer nut who went out and bought an old 5-level TTY and built his own interface for it so he could have nice hard copies of his programs? And then he found out that the supplier of his favorite version of BASIC would not disclose the source listing of the program so that our hobbyist friend could make the changes necessary to use his new printer! Well, he shouldn't be feeling lonely. There are a lot of us who have been in a similar situation, wanting to make enhancements in undocumented software.

There is a way to add all sorts of nice things to the programs we have purchased from tight-lipped vendors, if only we know the locations in the programs

that are used to control the input and output devices. Fortunately, these locations are usually not kept secret. Even if they were, there are ways to implement hardware traps to learn the location of the hardware-controlling routines. But the subject of hardware traps is beyond the scope of this article.

Start Simple

Let us consider the simpler problem first. Suppose we want to add a hard-copy device to a BASIC-language system consisting of a CPU, a TV display terminal and an audio cassette tape drive. We have been using a BASIC compiler that allows us to save and load programs through the audio tape interface. But there is no provision for transferring the output from the TV terminal to the hard-copy device whenever we want to, so that we can save either program listings or the results of computations.

Of course, if we know the locations in BASIC that handle the input and output operations, we can always change the I/O port assignment and status word bit-pattern mask by flipping front-panel switches (if any exist on our system!) every time we want to switch from our

nice quiet TV display to a noisy printer, but this is frustratingly time consuming and error prone.

Let us instead incorporate a way to switch our output from the TV display to the hard-copy printer and back with a single console keystroke, which we will make invisible to the main program. This method requires only that we know the location of the console input and output driver routines.

We will also need a little memory not accessible to the main program. This can be RAM that is not contiguous with the main memory (so BASIC doesn't know it's there), or we can reserve a little space at the top of main memory when BASIC asks "MEMORY SIZE?" (If the program you want to modify does not incorporate this feature, use "hidden" RAM, which is separated from the main storage.)

With the method described below, we can reassign any number of I/O devices at will and can even assign blocks of RAM memory as "mass" storage, making multi-pass assemblers run faster than they would in a disk-oriented system! . . . with no tape to rewind between passes.

Patching the Main Program

Somewhere in our main program is a console input routine that looks something like that shown in Example 1, or would, if we had the source listing. Since we don't, we will have to hand disassemble the code around our input routine to figure out the exact conventions used for reading the keyboard status, reading the keyboard data and passing it back to the calling program. Whatever the case, do not execute the code at this location. Instead, substitute a JUMP instruction to our input patch.

In a stack-oriented microprocessor this will leave the main program's calling address on the top of the stack. For register-oriented micros or minis we will preserve the contents of all registers anyway, so the return convention will not be disturbed.

Our input patch will look for an input character just as our main program did. But now we will not simply return to the calling program. We are going to examine the character to see if it is one of a number of special control characters we are using to implement our device reassignments. If it is, we will execute the reassignment and

jump back to the input routine to fetch the next operator keystroke. This next keystroke is the one we will send back to the main program. This way, our special characters are never seen by the calling program.

Selecting Special Characters

Any keyboard character that is *never* used by the main program qualifies as a special control character. These usually include a number of control characters, usually designated by "tT," for example, produced by holding down the CTRL key and pressing a letter key. There are only a few control keys used by most programs, leaving us a rather large number to use for our special controls.

For our simple example we will need only two special characters. So we choose "tT" to switch all output to the hard-copy device and "tV" to switch all output back to the TV display. To see how these controls can be used, consider a typical BASIC programming session.

Using the Controls

BASIC is loaded from the cassette tape, and we have keyed in a program that is designed to produce some nicely formatted numeric output (I plan to use this as "Table 1" in a future article for *Kilobaud*). We try running the program, and the output is garbage. Listing the program on the TV screen 16 lines at a time does not disclose the source of the error, so we need a hard-copy listing to permit examining the program as a whole. We enter the following keystrokes: LIST tT CR, and our program is printed out on the TTY—from the CR we entered last through the "OK" that follows the listing. We now key in "tV" and we are back with the TV as the output device.

Having the entire program to examine at once, we are able to spot the error that was entered while the dog was chewing on our shoelaces. Exiling the mutt from the computer shack, we correct the error, and using the TV display we run the program. This time the output

looks good.

So now we roll the old yellow paper out of the TTY, roll in a sheet of nice bond paper, and key in: RUN tT CR, and our Table 1 appears on the TTY, nicely typed out. Don't forget to incorporate enough line feeds following the output to prevent the "OK" from appearing after the printout.

Implementing the Controls

Find the console input read routine in the main program, as discussed above, and patch in a jump to CNTIN, which is our control input routine. Example 2 is written using Intel 8080 Assembly language, but should be easily convertible to other small machines. CNTIN uses the "tT" and "tV" character codes to toggle a flag. CNTOU is our controlled output routine, which tests the flag to see whether the output goes to the TV display (CRTOU) or the hard-copy device (TTYOU).

The main program will also have to be patched at its output routine with a JUMP to CNTOU. CRTOU and TTYOU are device-specific driver routines for the TV display and the TTY. If the change made to the system is the addition of the TTY as described above, CRTOU will be the same instruction sequence as the original output routine.

Note that in Example 2 CNTOU expects that the character to be output will have been pushed onto the stack on top of the return address. This convention is used by Altair BASIC and is included here as an example of how to handle different conventions. Be sure to use the correct convention for the program you are patching.

The device driver routines themselves are hardware dependent and will vary from one machine to another and from one I/O board to another. The examples given here, therefore, do not include the actual I/O port addresses or status bit mask values.

Other Applications

Expansions of the same technique can be used to implement enhancements to almost

INPUT	IN	STATUS	LOOK FOR OPERATOR INPUT
	ANI	MASK	MASK OFF DATA READY BIT
	JZ	INPUT	NOT READY, WAIT
	IN	DATA	GET THE CHARACTER
	RETURN		AND RETURN

Example 1.

```

; CONSOLE IN/OUT WITH CONTROLS V78.0      6 MAR 78
CNTIN:  IN      STATUS      ; LOOK FOR INPUT
        ANI     MASK        ; DATA READY?
        JZ      CNTIN       ; NOT YET
        IN      KEYBD       ; READ KEYBOARD DATA
        CPI     14H         ; IS IT CTRL T?
        JZ      CTRLT       ; YES!
        CPI     16H         ; OR CTRL V?
        JZ      CTRLV
        RET                     ; NO, RETURN IT
CTRLT:  MVI     A,OFFH       ; SET TTY FLAG
        STA     FLAG
        JMP     CNTIN       ; GET NEXT CHARACTER
CTRLV:  MVI     A,O          ; CLEAR FLAG
        STA     FLAG
        JMP     CNTIN       ; AND CONTINUE
CNTOU:  LDA     FLAG        ; TEST OUTPUT DEVICE
        CPI     0
        JZ      CRTOU
        IN      TTSTAT      ; OUTPUT TO TTY
        ANI     TTMASK      ; WHEN READY
        JZ      TTYOU
        POP     PSW         ; CHARACTER TO
        OUT     TTYPT       ; TTY PORT
        RET                     ; AND RETURN
CRTOU:  IN      CRSTAT      ; OUTPUT TO CRT
        ANI     CRMASK      ; WHEN READY
        JZ      CRTOU
        POP     PSW
        OUT     CRTPT
        RET                     ; AND ALL DONE!
END

```

Example 2. The control input and output routines that are hidden away in an "invisible" area of memory. These routines enable the selection of the output device.

any program. For example, a pair of control characters could be used to implement a pause and continue in any program that continually tests the keyboard during execution. This is handy for slowing things down as they flash by on the TV display.

In another application, after the amount of main memory was doubled in a mini—to make room for more application programs—the extra memory was used as a "mass storage" device for the text editor output and assembler input. The assembler operation was speeded up dramatically. The control input routine was used to direct the text editor output from the usual paper tape "punch" device to the top half of the main memory.

The new control routine took

care of placing each output character into the next successive memory location. When the assembler was then loaded, "tR" was used to "rewind" the source code "tape" by resetting the memory pointer to the start of the buffer. Another control character was used to switch the assembler from the original paper tape reader input to the memory-as-reader routine.

The resulting system would assemble faster than a disk-operating system, at a fraction of the cost of a disk, but of course without the same amount of storage a disk would provide.

Only the I/O driver program locations within the original operating system were known, but then they were all we needed to know to add useful enhancements like these. ■

Look to Aristo/Polks for reliability, quality, product versatility and value.

IN NEW YORK CITY

OHIO SCIENTIFIC & ARISTO/ POLKS FULL STOCK AND SERVICE ON CHALLENGER MICRO-COMPUTERS.

CHALLENGER C1P 8K	\$399.00
C1P 5" FLOPPY 20K	\$1250.00
SUPERBOARD C1P	\$299.00
CHALLENGER (COLOR) C4P 8K	\$750.00
C4P FLOPPY 24K 5"	\$1795.00
CHALLENGER C8P	\$950.00
COLOR-DUAL 8" FLOPPY C8P	\$2895.00
C-3 48K DUAL FLOPPY 8"	\$4095.00
C-3 + 23 MEG HARD DISK	\$12,995.00
C-2-0EM 48K DUAL FLOPPY 8"	\$2799.00
PLUS ALL SOFTWARE & PERIPHERALS	

Mail order invited if machine can be sent back to us for service. 220V conversions available for systems—write for quote. Write for free catalog. M/C, VISA, AX CARDS ACCEPTED.

Aristo/Polks • 212-279-9034
314 5TH AVE. (32 ST) N.Y.C., N.Y. 10001
9:30/6-DAILY ■ THURS TIL 9 ■ SUNDAY 11-5

Look to Aristo/Polks for reliability, quality, product versatility and value.

TRS-80 COMPUTING
nonprofit newsletter

12 Issues For \$15.00
and now (US)

PEOPLE'S SOFTWARE
at popular prices

oTape 1: 34 Level II or 24 Level I (indicate which you want) business, home, educational. \$7.50
oTape 2: 77 Level II from Common Basic Programs by Osborne Associates. \$7.50
oTape 3: People's Pascal program development system. \$15.00
oTape 4: 21 misc. Level I programs. \$7.50
oTape 5: 28 misc. Level II programs.
oTape 6: People's Pascal II. \$23
oTape 7: 31 misc. Level II programs. \$7.50
—Add \$.50 P&H per tape; CA res. add tax—

COMPUTER INFORMATION EXCHANGE
✓ 133

Box 158 San Luis Rey, CA 92068

BUSINESS SOFTWARE
IBM* 5110 & 5120

Significantly enhanced versions of the Osborne & Associates systems. Price is \$300 per system or all four \$1000. Demo disks \$15.00. Documentation books \$20.

General Ledger/Cash Journal: Flexible organization and reporting. Nine levels of user defined totals by month, quarter and year. Detail transactions report with descriptions.

Accounts Payable: Good reporting aged reports. Fully integrated to General Ledger.


Accounts Receivable: Open item apply payments by invoice or without invoice. Aged reports & statements. Fully integrated to general ledger.

Payroll: Regular, overtime & piecework pay. Departmentalization. Open ended number deductions & special pay with quarter and year totals.

COMPUTER SUPPORT SYSTEMS, INC. ✓ 331
Box 2134
N. Mankato, MN 56001
(507) 625-2205

*IBM trademark of International Business Machines

Z-80 USERS — would you like to use TRS-80* Software? Our assembled interface and complete documentation allow you to load and interface TRS-80* cassette programs. \$30.00



¿COMPUPRISM? COLOR

GRAPHICS FOR THE S-100 BUS. 16K OF ON BOARD MEMORY CAN BE USED AS RAM. 2 OR 4 MHZ OPERATION. HIGH RESOLUTION (144 H. BY 192 V. PIXELS) WITH 16 COLORS AT THE SAME TIME. NO ADDRESS JUMPS MAKE PROGRAMMING EASY. SOCKETS FOR ALL I.C.'S. KIT \$240. A AND T \$280

Bare board with documentation \$45.

ALL ORDERS SHIPPED COD WITHIN 72 HOURS. 4 MHZ MOD FOR S.D. SYSTEMS. EXPANDORAM \$10. 16 CHANNEL A-D. 8 CHANNEL D-A FOR S-100 BUS. BARE BOARD WITH DOCUMENTATION \$30. ✓ 180

J.E.S. GRAPHICS P.O. BOX 2752
TULSA, OK. 74101 (918) 742-7104

DATA-BASE MANAGEMENT

- INITIALIZATION: of any data base by no. of records, no. of fields, name of fields, no. of characters per field.
- SELECTIVE LISTING: on any field.
- MENU DRIVEN: for easy operation, addition, lookup, change, delete, list.
- HASHING: for fast operation on large files.
- FREE! APPLICATION: mailing list generator with multi-key selective listing.

NORTH STAR: DISK	\$29.95
TRS-80: DISK OR CASSETTE	\$29.95
LISTINGS: FOR ABOVE	\$20.00

Computer Data Services ✓ 184

PO Box 1626, Melbourne FL 32935

Micro Discount Service

SORCERER by Exidy

Z80 Processor	Dual Cassette I/O
Full-size ASCII Keyboard	Serial and Parallel I/O
Calculator Style Numeric Pad	30 x 64 Character Display
8K RAM (up to 48K RAM)	240 x 512 Graphics Resolution
Resident 4K Monitor ROM	64 User Definable Characters
Interchangeable ROM Packs	S-100 Compatible

with 16K RAM \$1295
FREE 12" Video Monitor valued at \$149

with 32K RAM \$1395
FREE Monitor and \$60 of Software

with 48K RAM \$1495
FREE Monitor and Software Development Package

Do you need a disk system, software, memory expansion kit, accessories, or manuals for your Sorcerer? Write and find out why we're called a Discount Service.

WE PAY ALL SHIPPING AND HANDLING WITHIN THE US
Connecticut residents please add 7% sales tax
Shipment stock to 30 days

198 General Lyon Rd., Eastford, CT 06242
203-974-1214 ✓ 126

Apple Owners: VALUABLE FREE CATALOG

Software and Hardware for Business Education Entertainment

Recent Arrival:

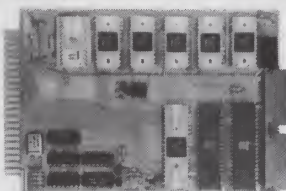
A STELLAR TREK the definitive Hi Res color version of the classic Startrek game. Three different Klingon opponents. Many command perogatives from use of weapons to repair of damages. Need 48K Applesoft ROM Disk. \$24.95

To order, add \$2.00 U.S. / \$5.00 Foreign shipping charges. California residents add 6%. Don't see what you want here. THEN write or call today for your FREE software and hardware catalog.

Open Tuesday - Sunday via. Mastercard welcome



Garden Plaza Shopping Center
9719 Reseda Blvd., Northridge, Calif 91324 Dept 6B8
Telephone: (213) 349-5560



SINGLE BOARD COMPUTER \$99.50*

with 6800 MPU, 6850 serial I/O, 2 6820 parallel I/O (32 lines), 512 RAM, socket for 2708, 2716, EROM. Interface modules for industrial control, data acquisition, lab instrumentation, on 44 pin 4 1/2"x6 1/2" PCB's. RAM, ROM, CMOS RAM/battery, A/D, D/A, Driver/Sensor, Serial I/O, Parallel I/O, Counter/Timer, IEEE 488 GPIB, floppy controller.

*OEM (500 piece) price

WINTERK Corp.
1801 South Street
Lafayette, IN 47904
Phone (317) 742-8428 ✓ 163

TRS-80* DISK SYSTEM SUBROUTINES

provided in machine language for use directly from BASIC

KEYBOARD ROUTINE: Beeps on key input, repeats key when held down, selective lock out of ENTER, BREAK, CLEAR, SPACE, ↑, ↓, ←, → also and, when multiple entries are not required. Also lock out of non-numeric keys for numeric entries. Does not affect NEWDOS operation of JKL. Does not bounce. Clear unshift gives clear entry function. Clear shift clears screen

LARGE INTEGER FUNCTIONS: Store and recall to disk not only 3 digits to one byte and 5 digits to two bytes, but also 8, 10, 13, 15, and 17 digits to 3, 4, 5, 6 and 7 bytes respectively. Saves a lot of disk file room

COMPRESSED ALPHA: Store up to 4 alpha characters in 3 bytes

LINE PRINTER TEST ROUTINE: To save your TRS-80 hanging up with a "not ready" code from your line printer, this routine gives an error message — without destroying the screen contents

ALL THESE ROUTINES fit into less than 10 sectors on the disk \$25 for any one routine, \$20 for the second and above \$2.50 postage etc required. Cheque, Money Order

Ontario residents add 7% SALES TAX

Specify 16K, 32K, 48K, NEWDOS, or TRSDOS when ordering

Harris Data Systems
2390 Eglinton Avenue East, Suite 208,
Scarborough, Ontario M1K 2P5
(416) 759-6235 ✓ 168

*TRS-80 is a registered trademark of Tandy Corp

CP/M[®] USERS! The ED-80 TEXT EDITOR

- \$50,000 in Development Costs — Yours for Only \$99!
- For all CP/M, Cromemco, TRS-80 Mod II, and North Star Systems.
- Full Screen Text Editor w/Scrolling.
- For all CRT and Video Monitors.
- Features Found only on IBM, CDC, UNIVAC and DEC Systems.
- Forward or Backward Locate and Change Commands.
- Field Proven — More than 2 Years.

A Terrific Value — **\$99.00** Write for FREE Color Brochure

Software Development & Training, Inc.
Post Office Box 4511, Dept. K
Huntsville, Alabama 35802 ✓ 302
VISA or MC

TIS-Z80 APL

- * Stand alone APL for Z80 occupying 28k (includes OS & DOS)
 - * File and system functions available within user functions
 - * 3-D Matrix, inner and outer products
 - * Catenate, scan, compress, reduce and rotate along specified axis.
 - * Use APL character set or ASCII substitutes
 - * Interaction with large mainframes using APL
 - * Custom versions for many popular Z-80 based computers
- TELECOMPUTE INTEGRATED SYSTEMS INC
251 SPADINA AVE., ✓ 118
TORONTO, ONTARIO CANADA M5T 2E2
PHONE: 416-363-9295

HIGH SPEED 16K MEMORY \$48.00

Set of 8 4116 RAM chips, for use in Apple, Heath, Pet or TRS-80. Add \$3.00 for shipping & handling (CA residents add 6% sales tax).
Visa, Mastercharge orders
800-538-8559 (outside CA).

exatron ✓ 57
181 Commercial Street
Sunnyvale, CA 94086
408-737-7111

6800-6809

Modem Program With Disc File Transfer

Instructions and Source Listing \$25.00
Disc with source and object, add \$10.00

Specify 6800 or 6809, 5" or 8", modem port number (serial interface), SSB, MiniFlex, Flex 2.0 or Flex 9, SWTBUG, Smartbug, GMXBUG, or SBUG-E.

Microtime

Circuit board and documentations \$ 35.00
Assembled and tested (push button set) \$ 95.00
Assembled and tested (software set) \$105.00

AAA Chicago Computer Center
120 Chestnut Lane
Wheeling, IL 60090 ✓ 178
(312) 459-0450

Dealer for Cimix, SSB, SWTPC and TSC

16 K UPGRADE \$66⁹⁵

TRS80, APPLE II,
AND SORCERER

HIGH QUALITY PRIME 16K RAMS FOR MEMORY UPGRADE. THE KIT INCLUDES, THE RAMS, SHUNTS AND INSTRUCTIONS TO ALLOW EASY UPGRADE IN MINUTES. ALL PARTS CARRY 12 MONTH WARRANTY.

TO ORDER, SPECIFY KIT AND ENCLOSE CHECK OR MONEY ORDER. ADD \$2.00 POST AND PACKING; TEXAS RESIDENTS ADD 5% SALES TAX.

IAN ELECTRONICS ✓ 209
P.O. BOX 14079
AUSTIN, TEXAS 78761

**We buy electronic
industrial inventories.**

**Immediate quotes—
highest prices paid.**

DELTRONIKS ✓ 111
5151 Buford Highway
Atlanta, GA 30340
(404-458-4690)

data management system OHIO SCIENTIFIC OS-65U SOFTWARE

FILE MANAGER • Extremely flexible and easy to use.
• ADD • CHANGE • DELETE • INQUIRY • CHANGALL
• Full screen formatting on most crt's
• Automatic file compression on deleted records
• Select any or all fields to work with
• FAST random access. Multi Key
• Replaces your OS-DMS file editor

BP SORT • HIGH SPEED machine code sort
• Sort any length file • Floppy/Hard disk
• Up to five keys • Ascending/Descending
• Sorts 20,000 bytes in less than 10 seconds
• Interface to permit sorting OS-DMS files

EZ UTILITIES • Creates OS-DMS compatible files and records
• Left Justifies fields in OS-DMS records
• Documentation Aid—prints OS-DMS file headers

EZ-REPORT • Reports writers for OS-DMS files
• Reads multiple surfaces and diskettes

Complete Data Management Package (menu driven)..... \$249.00
BP Sort alone..... \$124.00
Data Management Package less sort..... \$149.00

• all software OS-DMS compatible—requires OS-65U •

DES MOINES COMPUTER ✓ 182

515-287-7397 • 4456 Parklawn Dr. • Des Moines, IA 50321
C.O.D. • VISA • MASTER CARD

779 UPPER CASE/lower case "Conversion Kit I"

Expand the capabilities of your 779 line printer to include word processing!! Available to all Centronics 779/TRS 80 Printer I owners is the option of lower case and changing slash 0 Zero to standard 0. No etch cuts or soldering needed. Installs in minutes with a screwdriver. No program modification or additional interface is required. **Price \$125.00**

Motor Control "CONVERSION KIT II"
FOR ALL CENTRONICS 779/TRS 80 PRINTER I LINE PRINTERS!!
Our "Conversion Kit II" Motor Controller gives your 779 the ability to turn the motor on and off automatically. Removes the annoying noise of constant run, increasing the life span of your 779 / TRS 80 line printer motor! No soldering, software or hardware changes needed. Installs easily. **Price \$95.00**

SAVE! Buy Service Technologies "Conversion Kit I" and "Conversion Kit II" together for the single price of **\$199.00**

To order, please send check or money order in the proper amount to:



Service Technologies, Inc.
32 Nightingale Rd.
Nashua, N.H. 03062 ✓ 208
(603) 883-5369

Visa and Master Charge accepted (please include signature, expiration date and phone number)

Service Technologies will pay all shipping and handling.

MUSICAL COMPUTER I AND II

Learn How to Read Music!

Music lessons taught at your home or at a studio cost from \$7/half hour and up! Now, available to you Apple II and TRS-80 Level II owners is an opportunity for you to have your private music teacher in the comfort of your own home.

Written by an M.A. educator with over 20 years of music experience, this two-program cassette provides an **alternative** to music education that will make music learning fun and enjoyable for the entire family!

32K Apple II 16K TRS-80 Level II

\$34.95 plus \$1.00 for postage and handling

Check or Money Order Only
(Mi. residents add 4% sales tax)

Apple II is a TM of Apple Computer, Inc.
TRS-80 is a TM of Tandy Corp.

COMPUTER ✓ 215 P.O. Box 605
APPLICATIONS Birmingham,
TOMORROW Mi. 48012

CT-1024 Terminal Modifications

Expand your cursor control capability, and add a clock.

Fred Cooley
4646 Willis Ave.
Sherman Oaks CA 91403

This article describes two circuit diagrams for the SWTP CT-1024 CRT terminal that I've built and tested on my machine. These modifications will be useful for any CRT terminal device.

Expanded Capability Cursor Control

The heart of the CT-CA computer-controlled cursor board is the 7445 BCD-to-decimal decoder, which breaks down the ASCII control characters to one of ten different outputs. By replacing the 7445 with one or two 74154 demultiplexers, either 16 or 32 outputs may be obtained (see Fig. 1). These control character outputs serve those functions handled by the CT-CA board, and also control other internal functions such as page select, cursor on/off, cursor solid/blinking or any external function.

All outputs can be computer controlled by outputting the proper ASCII control character. Any output to be "held" on is fed to an R/S latch. Connections to the CT-1024 are made using Molex pins over the CT-CA's connector strips J3 and J4. Don't use certain outputs: CTRL M — CT-1024 internal carriage return
CTRL J — CT-1024 internal line feed
CTRL C — SWTP 8K BASIC ready command
CTRL O — SWTP 8K BASIC back space
CTRL X — SWTP 8K BASIC de-

lete command

CT-1024 TV Clock

An article from *Radio Electronics*, July 1977, "Build This Digital On Screen TV Clock,"

describes the three IC clock. This modification (see Fig. 2) uses the same basic circuitry; however, the ac reference and horizontal and vertical sync pulses are taken from the

CT-1024, and the clock's output is fed along with the terminal's video output to an rf modulator. Thus, no circuitry within the TV itself is touched.

Time-setting functions, on/off display and 12/24-hour format are controlled by the expanded cursor control circuit using keyboard control characters to set or reset R/S latch circuits. The MM5318 digital clock IC has seven-segment outputs that can be interfaced to the SWTP 6800 computer as described in *Byte*, November 1977, "Does Anybody Know What Time It Is?"

This circuit requires four connections to the CT-1024. The ac reference is obtained at J-11, pin 5; horizontal sync and vertical sync are taken from IC17, pins 5 and 4, respectively, and the video output is tied to J-10, pin 11. ■

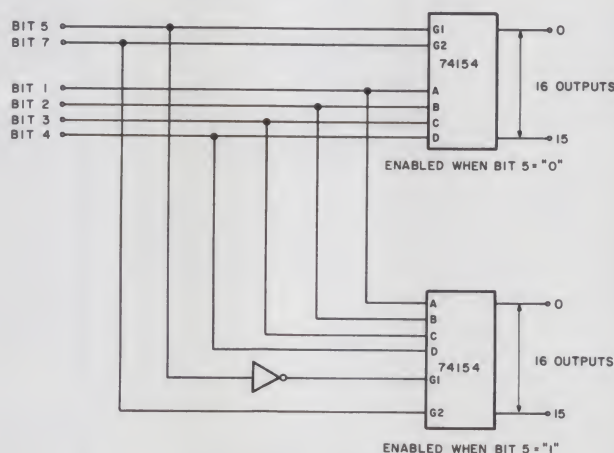


Fig. 1. Cursor control circuit.

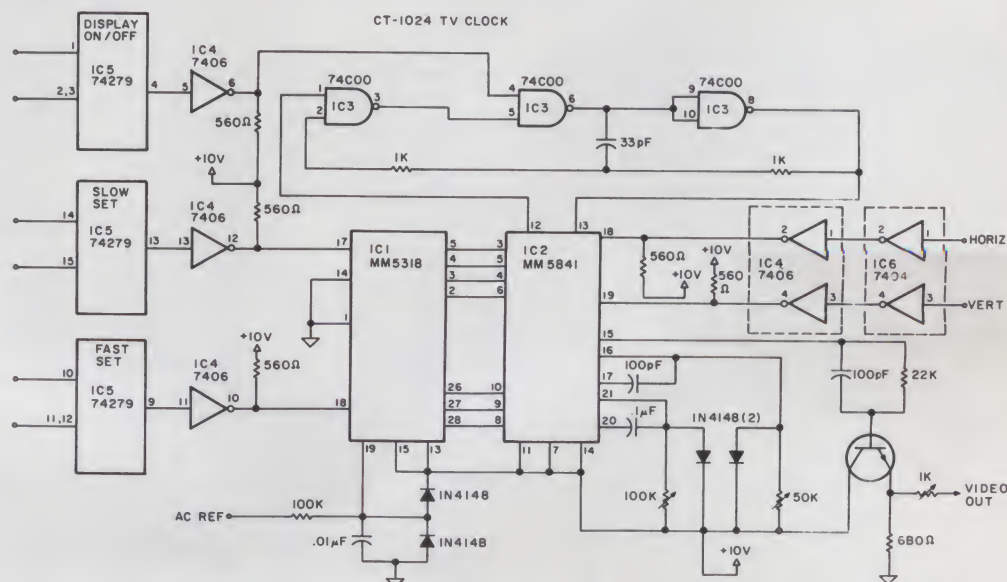


Fig. 2. TV clock circuit.

SOFTWARE WANTED

If you are an
inventive programmer
and could use
an extra income,
please call:
(213) 894-9154

We are interested in
Games and Business software.

Royalty or Cash-out basis.

DATASOFT
16606 Schoenborn St.
Sepulveda, Ca. 91343

✓ 46

Desk Main/Frame Desk Main/Frame

LOW COST & ATTRACTIVE STYLING

- MAIN/FRAME INTEGRATED INTO FURNITURE QUALITY DESK
- ELECTRONICS PACKAGE SLIDE MOUNTED FOR EASY ACCESS
- SUPPORTS TWO 8" FLOPPY DRIVES FROM SEVERAL MANUFACTURERS (DRIVES NOT INCLUDED)
- 10 SLOT MOTHERBOARD INCLUDES CONNECTORS
- POWER SUPPLY FOR DRIVES AND CARDS
- DESK AND MAIN/FRAME AVAILABLE SEPARATELY
- MATCHING PRINTER DESK AVAILABLE



WRITE OR CALL FOR OUR BROCHURE WHICH INCLUDES
OUR APPLICATION NOTE: 'BUILDING CHEAP COMPUTERS'

INTEGRAND

✓ 175

8474 Ave. 296 • Visalia, CA 93277 • (209) 733-9288
We accept BankAmericard/Visa and MasterCharge

KIM
SYM
AIM

ATARI

MICRO
The 6502 Journal

PET
APPLE
OSI

Are you tired of searching through computer magazines to find articles that relate to your 6502 system? Since 1977 **MICRO** has been devoted exclusively to 6502 systems. On a regular monthly basis, **MICRO** publishes application notes, hardware and software tutorials, interfacing information and program descriptions with complete source listings, a continuing 6502 bibliography, with the same printed quality as the magazine you are now reading. In the near future, **MICRO** plans to add a hardware catalog, product evaluations, technical data sheets, and a news section on current 6502 happenings. We have already published over 24 issues and our worldwide circulation has been growing with each issue. **MICRO** is the complete reference source for all 6502 enthusiasts, and we're prepared to let you see for yourself. If you haven't seen **MICRO** yet, write to the address below for a FREE sample copy. No matter what computer magazines you have, if you are serious about 6502, you need **MICRO**!

You can order twelve issues of **MICRO** for \$15.00 within the United States, or for \$18.00 outside the U.S. Air mail subscriptions cost \$27.00 in Central America, \$33.00 in Europe and South America, and \$39.00 in all other countries.

P.O. Box 6502
Chelmsford, MA 01824

✓ 309

CompuCover®



COVER YOUR INVESTMENT

- Cloth Backed Naugahyde Vinyl
- Improved Reliability
- Longer Life
- Waterproof & Dustproof
- Two Decorator Colors
Saddle Tan • Black

TRS-80 MODEL II Entire Unit \$22.95 Keyboard Only 7.95	Full Apple II \$12.95 Apple II Keyboard 9.95 Apple II Disk 3.95	HAZELTINE 1400 1410 1500 1510 1520 1552 \$18.95 Soroc JD 120 18.95 Adco Terminal 19.95 25 100 980 etc 14.95 ADM-3 9.95 Video 100 9.95	Centronics Printers 700 701 702 703 19.95 P1 730 737 9.95 779 17.95 T 1 800 Series 19.95 Trendcom 100 & 200 9.95 Decwriter III 19.95 I D S 440 12.95
TRS-80 MODEL I Keyboard \$7.95 Cassette 4.95 Video Display 9.95 Package Offer 19.95 *Note: Add \$3.00 for EXPANSION INTER	Pet Computer \$12.95 Pet 2040 Disk 12.95 Pet 2022 Printer 9.95 Pet 2023 Printer 9.95	Vector M2 \$14.95 N. Star Horizon 14.95 Computer II 19.95 H. P. 85 14.95 OSI C4P 14.95 Sorcerer 9.95	TRS-80 Disk Double Disk 7.95 Parcom Disk 4.95 MPI B51 B52 4.95 Lobo Mini Disk 6.95 Matchless Mini 6.95 Vista Mini Disk 6.95

Send check or money order to:
Include \$1.00 for postage and handling.
Overseas orders include \$3.00 postage.
DEALER INQUIRES INVITED

CompuCover® ✓ 90
P.O. Box 324 (Dept. A)
Mary Esther, FL 32569
Phone (904) 243-5793

Educational Software Professionals, Ltd.



APPLE-GRAMMAR

APPLE-GRAMMAR is a program that covers 7 parts of speech of the English language. It quizzes children and reinforces specific parts of grammar that need attention. The parent or teacher can easily enter the program and make desired modifications. At the end of each segment, that portion is corrected with an appropriate explanation and reinforcement. The program results are then compiled and graded and the drill is ready for continued use.

APPLE-GRAMMAR requires 32K in Applesoft and a disk drive, \$19.95.

Teachers' Aide I and II

Teachers' Aide I allows the teacher to construct quizzes and tests which are stored on the disk as text files. The teacher then has complete control over the editing and revision of these files. It, also, allows individual students to take the teacher constructed quiz or test on the computer and then automatically saves the individual student's score to a score file created by the teacher. Teachers Aide I with Multi-Choice format requires 32K in Applesoft and a disk drive. \$19.95

Teachers' Aide II with True and False format requires 32K in Applesoft and a disk drive. \$19.95

38437 Grand River • Farmington Hills, MI 48018
(313) 477-4470

Dealer' Inquiries Welcome

✓ 156

Is HARD COPY STORAGE a problem?

KILOBAUD MICROCOMPUTING, as thick as it is, is more like a floppy when it comes to standing on the bookshelf. Try the **KILOBAUD MICROCOMPUTING Library Shelf Boxes**... sturdy corrugated white dirt-resistant cardboard boxes which will keep them from flopping around. We have self-sticking labels for the boxes, too, not only for **KILOBAUD MICROCOMPUTING**, but also for **73 Magazine**, **80 MICROCOMPUTING**... and for **CQ**, **QST**, **Ham Radio**, **Personal Computing**, **Radio Electronics**, **Interface Age**, and **Byte**. Ask for whatever stickers you want with your box order. They hold a full year of **KILOBAUD MICROCOMPUTING**, **80 MICROCOMPUTING**... or **73 Magazine**. Your magazine library is your prime reference; keep it handy and keep it neat with these strong library shelf boxes. One box (BX-1000) is \$2.00, 2-7 boxes (BX-1001) are \$1.50 each, and eight or more boxes (BX-1002) are \$1.25 each. Be sure to specify which labels we should send. Have your credit card handy and call our toll-free order number 800-258-5473, or use the order card in the back of the magazine and mail to:

kilobaud

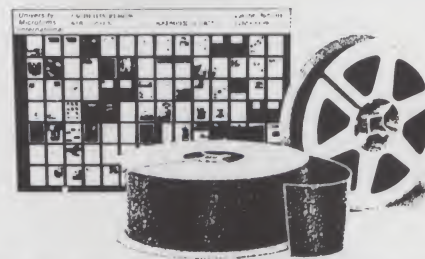
TM

MICROCOMPUTING

peterborough nh 03458



this publication is available in microform



Please send me additional information.

University Microfilms International

300 North Zeeb Road
Dept. P.R.
Ann Arbor, MI 48106
U.S.A.

18 Bedford Row
Dept. P.R.
London, WC1R 4EJ
England

Name _____

Institution _____

Street _____

City _____

State _____ Zip _____

— Professional — Real Estate Software

For Apple or TRS-80

Property Management System (32K, 1 Disk Systems)

Features:

- Tenant Information
- Late Rent Reports
- YTD & Monthly Income
- Handles —
 - Partial Payments
 - Returned Checks
 - Advance Payments
- Prints Receipts
- 5 Digit Expense Accounts
- Building Expense Report
- Vendor Expense Report
- Income Tax Report
- All Reports Can Be Printed
- Complete Documentation
- Easy Data Entry & Edit
- 200 Units per File

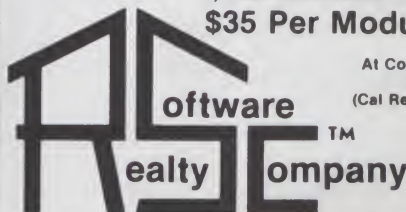
Price \$225.00

Real Estate Analysis Modules:

(Cassette or Disk)

- 1) Home Purchase Analysis
- 2) Tax Deferred Exchange
- 3) Construction Cost/Profit
- 4) Income Property Cashflow
- 5) APR Loan Analysis
- 6) Property Sales Analysis
- 7) Loan Amortization

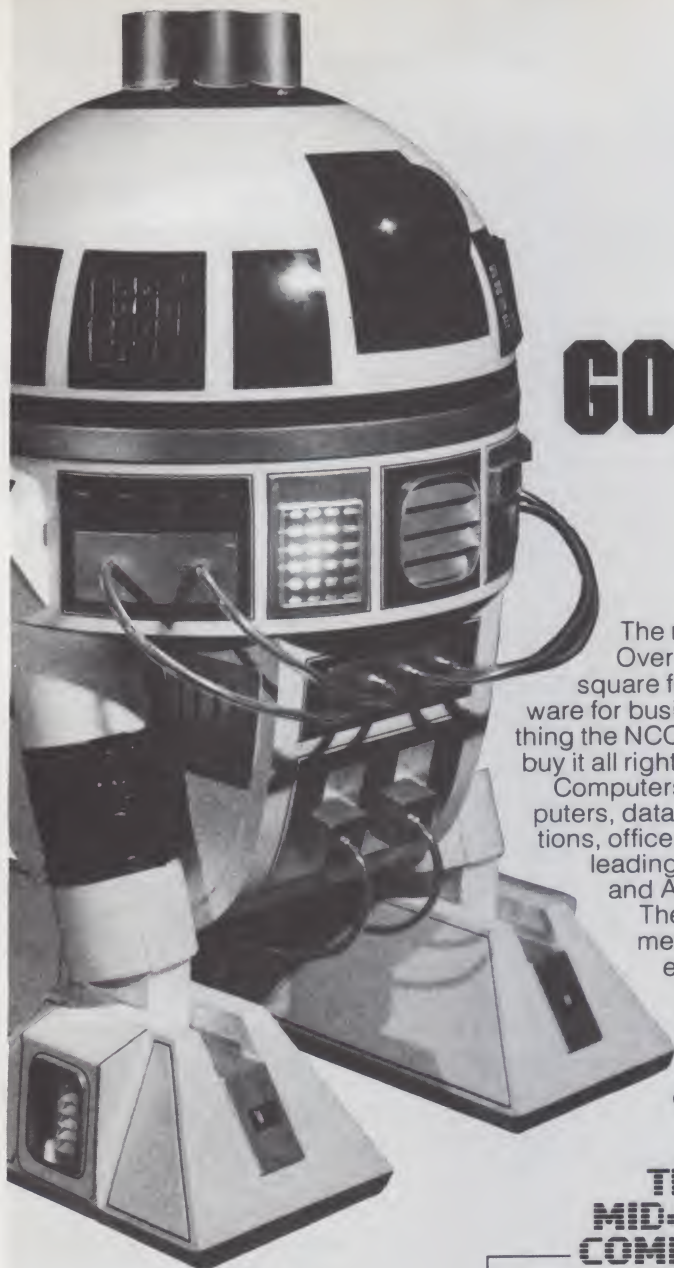
\$35 Per Module



At Computer Stores Everywhere
Or Order COD Direct
(Cal Residents Add 6% Sales Tax)
(213) 372-9419

✓ 117

Dept. K 2045 Manhattan Ave., Hermosa Beach, CA 90254



THE NATIONAL COMPUTER SHOWS HAVE WE GOT A PROGRAM FOR YOU!

The new computers are showing off. Over \$50 million worth of equipment in over 100,000 square feet of space, including the latest software and hardware for business, government, home and personal use. Everything the NCC show has and more will be on display, and you can buy it all right on the spot.

Computers costing \$150 to \$250,000, mini and micro computers, data- and word-processing equipment, telecommunications, office machines, peripheral equipment and services from leading names in the industry like IBM, Xerox, Radio Shack and Apple will all be there.

There'll be conferences on business uses of small to medium sized computers, and how to make purchasing evaluations.

There'll be robots, computerized video games, computer art and computer music.

Everyone from kids to people who earn their living with computers will have a great time at the largest computer show ever organized in each region.

Admission for adults is \$5. The public is invited, and no pre-registration is necessary.

Don't miss the computer show that mixes business with pleasure. Show up for the show.

THE MID-ATLANTIC COMPUTER SHOW

WASHINGTON, D.C.
D.C. ARMORY/STARPLEX
THURSDAY-SUNDAY
SEPTEMBER 18-21
11 A.M. TO 9 P.M. THURS.-SAT.
11 A.M. TO 5 P.M. SUN.

THE MID-WEST COMPUTER SHOW

CHICAGO
McCORMICK PLACE
THURSDAY-SUNDAY
OCTOBER 16-19
11 A.M. TO 9 P.M. THURS.-SAT.
11 A.M. TO 5 P.M. SUN.

Produced by National Computer Shows,
824 Boylston Street, Chestnut Hill, MA 02167.
Telephone (617) 739-2000.

Please send me:

- ☐ _____ adult tickets at \$5 each. I have enclosed the proper amount of \$ _____
☐ Information on the show's conference program.
☐ Hotel registration information ☐ Exhibitor rental information

Please print: Name _____

Address _____

City _____ State _____ Zip _____

THE NORTHEAST COMPUTER SHOW

BOSTON
HYNES AUDITORIUM
PRUDENTIAL CENTER
THURSDAY-SUNDAY
NOVEMBER 20-23
11 A.M. TO 9 P.M. THURS.-SAT.
11 A.M. TO 5 P.M. SUN.

MICRO-SCOPE

Pan Am Flies More Efficiently

Pan American World Airways plans to save more than 7,500,000 gallons of fuel a year for its fleet of 747 Jumbo Jets. They expect to realize this savings through the installation of Delco Electronics' new Flight Management System (FMS), a computerized system designed to minimize fuel consumption by regulating throttle adjustments to maintain optimum speed as selected by the pilot in conjunction with pitch control through the plane's automatic pilot system. The FMS takes into account and makes adjustments for the aircraft's constantly changing weight, altitude, outside temperature and other factors. In so doing, the FMS maintains the aircraft at a specified speed and minimized acceleration during maneuvering, thereby reducing unnecessary use of fuel.

The Flight Management Computer, which utilizes Motorola's NMOS LSI circuits, is being installed on 39 Boeing 747s, with six all-cargo 747s targeted for installation of the system at a later date. The airline plans to save approximately \$5.55 million per year.

Flying High with Help from TI

Computers are also helping to make the aviation industry more efficient through inventory control. Clients of Inventory Locator Service, Inc., of Memphis, TN, use a Texas Instruments 765 Data Terminal to tie into a central ILS host computer data bank, which inventories over a million available new and used aircraft parts and support items from many suppliers. In this way, the computer system, with built-in acoustic couplers, reduces airplane downtime and helps to get the planes off the ground with speedy, inexpensive inventory searches.

She Talks in Beauty

Who is generally recognized as the first computer programmer?

According to a course brochure from George Washington University, it was the Countess of Lovelace, a lady named Ada who is noted for her work in the middle 1800s with Charles Babbage, the "father of the computer." Her place in computer history has been duly recorded with the introduction of a computer programming language named after her. The new language, called Ada, was recently developed by the U.S. Department of Defense for use in embedded computer applications.

Incidentally, the father of Ada (the person, not the language) was George Gordon Byron, an early nineteenth century English poet, who is also noted for his work with language.

Making the Rounds

The medical data-processing community can now make use of a recently developed information service to aid in the understanding, evaluation and selection of a hospital laboratory computer system. "The MedSy Report on Clinical Laboratory

Computer Systems" contains teaching materials, service materials and research support to define the potential and capability of computers in this field and keep users informed of any new developments or changes.

This product results from three years of clinical laboratory systems research from leading American universities and private hospitals. The service includes receipt of a MedSy handbook to help you evaluate and select a system for your particular needs. Subscribers receive updated information supplied on a bimonthly basis. For more information, contact Medical Systems Research, Inc., 2025 N.W. 24th St., Gainesville, FL 32605.

CRT Terminal Users Favor 80 Columns

What is the most popular CRT terminal size?

According to a recent survey conducted by Venture Development Corporation, a Wellesley, MA, consulting firm, users of alphanumeric CRT terminals express a strong preference for 80-column by 24-row displays. The 80-column display has become standardized to the point where only five percent of users surveyed prefer displays with fewer columns, and only nine percent have a preference for more than 80 columns. Although the 132-column display has applications in selected areas, most users are not willing to pay the increased price for a feature which they feel has only marginal value.

However, users expressed a desire for more total characters per display, but felt this should be done through additional rows, not more columns. A 25th row is highly desirable, as are additional rows, for word-processing applications. The 25th row, which has been gaining wider acceptance, is used primarily for monitoring system status and control rather than for display of data.

Test Your ESP

Now you can test your extrasensory powers on your 16K TRS-80 with a new program from Manhattan Software, Inc., PO Box 5200, Grand Central Station, New York, NY 10017. E.S.P. Lab (\$9.95) can be used for research into possible extrasensory phenomena, as well as for testing the possibility of telepathy, clairvoyance, precognition and telekinesis. It selects randomly from among a set of five symbols, presenting one symbol at a time on the screen for telepathy experiments. All symbols are programmed in machine language and appear on the screen instantaneously. For clairvoyance and precognition testing, the program selects the symbol before or after the response, prompting only with a question mark on the screen.

A separate section provides a special computer-style test of possible telekinesis. A randomly moving dot is presented on the screen, and the experimenter may attempt to use "mental power" to influence the direction of movement of the dot.

Persons who become proficient at this program are requested not to enter within a 150-mile radius of the Mount St. Helens area.

ENTER: "Nightly News"

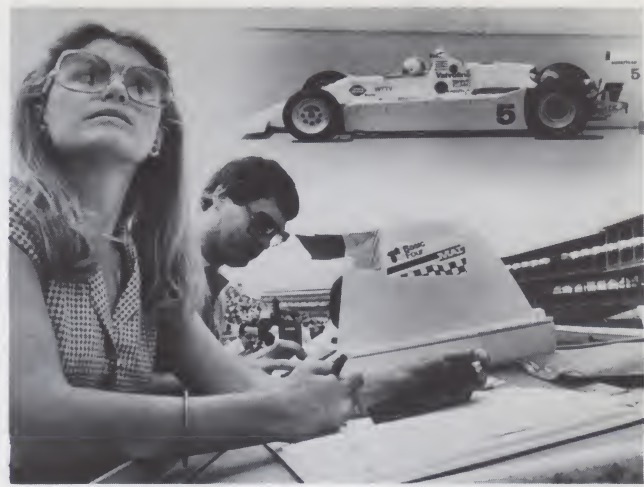
Computers may soon take the place of TV sets in bringing the nightly news into the family living room. Beginning this summer, 11 Associated Press members will begin an experiment into the new technology of information retrieval with CompuServe, Inc., a Columbus, OH, computer firm. Home personal computer owners will be able to obtain newspaper information by dialing special telephone numbers. The cost will be \$5 an hour to access news, sports, business and feature data provided by the newspapers and the AP. CompuServe also provides computer programming and games through an existing personal computing network available in more than 250 cities. Each newspaper will participate for a six-month period, providing news, features and advertising material in its community.

Computer Pit Stop

Al Unser's pit crew at this year's Indianapolis 500 Auto Race included the first computer ever to be used at Indy. The Basic Four System 410 small-business computer provided Unser with a computerized management information system. Designed for use in strategy planning for the race, the computer endured 100 degree temperatures, typical Indiana humidity and crackling spikes of electromagnetic interference to monitor the performances and positions of the 15 leading contenders.

For each car, the 410 computed the position in the race, total laps completed, lap number of last pit stop, track condition (yellow or green), yellow laps since last pit stop, total laps since last pit stop and total number of pit stops. Additionally, it tracked the fuel consumption of the car driven by Unser.

This data enabled Unser's racing team management to make split-second decisions to schedule pit stops under the most advantageous conditions. Electronic sensing devices and high-speed calculators are routinely used on the racing circuit, but the introduction of the computer represented an all-new dimension in race-management sophistication.



Laps driven by Al Unser were entered manually and stored in the Basic Four System 410 small-business computer, which provided racing strategy for the Unser racing team at the 1980 Indianapolis 500 Auto Race.

The computer consisted of a CPU with 96K bytes of memory, 14 megabytes of magnetic disk information storage capacity, three video display terminals, a 160 cps printer and a 9.2 megabyte tape cartridge for system backup and additional data storage capacity. The system functioned throughout the entire 500-mile race, keeping flawless track of the 15 selected cars and accurately recording Johnny Rutherford's first place finish in the race.

Unfortunately, the car driven by Unser, the only winner of auto racing's triple crown and three-time Indy 500 champ, did not match the computer's performance. Unser finished 27th in a field of 33, having to leave the race after 33 laps with a blown engine.

COMING NEXT MONTH

Next month's issue will place particular emphasis on the Commodore PET.

Among the articles and topics covered will be:

- A review of the new Video Interface Computer (VIC) from Commodore.
- Adding 16K to the PET.
- Interfacing PET and the H14 printer.
- Animated graphics.
- The conclusions to the "I/O Expander" and "IEEE 488" articles.

Even if you're not a PET user, there'll be something for you.

CALENDAR

Super Scarafest '80

Super Scarafest '80, an amateur radio and computer festival, will be held Aug. 16-17, 1980, at the Ramada Inn in North Haven, CT. Sponsored by the South Central Connecticut Amateur Radio Assoc., this event will include exhibitor booths, a ham and computer flea market and an auction.

For information, write: Super Scarafest '80, PO Box 5265, Hamden, CT 06518.

Eighth World Computer Congress

Australia will co-host with Japan the Eighth World Computer Congress scheduled for Oct. 6-17, 1980, and conducted by the International Federation for Information Processing (IFIP). The congress commences in Tokyo, Japan, Oct. 6-9 and concludes in Melbourne, Australia, Oct. 14-17. An exhibition of hardware and related services together with submission of papers and discussions will be scheduled in each location. A single registration fee will cover attendance at both locations.

For information, contact: The Eighth World Computer Congress, IFIP Congress '80, GPO Box 880G, Melbourne, Victoria, Australia 3001.

Four Tutorials Precede Compcon Fall '80

Four pre-conference tutorials will be presented on Monday, Sept. 22, 1980, immediately preceding Compcon Fall '80, sponsored by the IEEE Computer Society. "Distributed Processing," the theme of the conference, will be the unifying thread of the tutorials. Topics to be presented are: "Local Computer Networks," "An Overview of Distributed Processing," "Communication Technology in the 80's" and "Distributed System Design." Compcon Fall '80 is Sept. 22-25, 1980 at the Capital Hilton Hotel, Washington, DC.

For more information, write: Compcon Fall '80, PO Box 639, Silver Spring, MD 20901, or call 301-589-3386.

Conferences for Computer Use in Small Business

Three regional computer conferences will be held on the theme: Thinking Small—Using Small Computers to Increase Business Productivity. They will be held Sept. 18-21, 1980, in Washington, D.C.; Oct. 16-19, 1980, in Chicago, IL; and Nov. 20-23, 1980, in Boston, MA.

Sponsored by The Information Exchange, each conference program will be a four-day program designed to explore the opportunities presented by small computers for improved productivity in small businesses.

There will be a concurrent exposition at each location. For further details, contact Kendall Burroughs, at The Information Exchange, 1730 North Lynn Street, Suite 400, Arlington, VA 22209, 703-521-6209.

Mid-Atlantic Computer Show

The Mid-Atlantic Computer Show will be held at the D.C. Armory/Starplex, Washington, D.C., on Sept. 18-21, 1980. General adult admission is \$5 to this exposition featuring small and medium-sized business systems, scientific, engineering computers and microcomputers. For information, contact: National Computer Shows, 824 Boylston St., Chestnut Hill, MA 02167, 617-739-2000.

Conference for Consumer Electronics Instructors

The first special Conference for Consumer Electronics Instructors will be held as part of the NESDA/ISCET Convention, Aug. 18-23, at the Galt House, Louisville, KY. The concept of the Instructors Conference is to upgrade educational techniques for electronics instructors and to encourage the development of each curriculum to meet today's rapidly changing technology.

Important events at the week-long NESDA/ISCET Convention include the "Electronics Derby" trade show, the National Service Conference to discuss industry problems, business management and technical sessions and a special conference for electronics instructors. Various electronics firms will be sponsoring local trips, dinners, lunches and cocktail parties. For more information or registration blanks, write or call NESDA, 2708 West Berry St., Ft. Worth, TX 76109, 817-921-9061.

New Jersey Computer Show

The 1980 New Jersey Personal Computer Show and Fleamarket (NJPCS) will be the first home and hobby computer show ever held in Northern New Jersey. The show is Sept. 27 and 28 at the Holiday Inn (North) at Newark International Airport (NJ Turnpike Exit 14). Featured will be in an indoor commercial exhibit area, a large outdoor fleamarket and user group meetings/forums on the TRS-80, PET, Apple, Heath and other popular systems. For additional information, write: NJPCS, Kengore Corp., 9 James Ave., Kendall Park, NJ 08824.

AED Workshops

The Association for Educational Data Systems is offering a series of workshops especially designed for administrators, educators and computer professionals interested in computers in education.

Workshops offered include: Computers in Elementary Education, Aug. 21-22, 1980, in Denver, CO; Programming with Pascal—Learning When and Why, Sept. 25-26 in St. Louis, MO; Computerized Data Base Management, Oct. 9-10 in St. Louis, MO; Computers as Effective Tools for Education—The Evidence, Oct. 23-24 in Des Moines, IA; Word Processing, Nov. 7 in Wichita, KS; Design and Development of Computer-Based Instructional Materials, Nov. 12-13 in Orlando, FL; and Micro-Mini Computers, Personal Computers, and the Development and Evaluation of Educational Programs in Computer Science and Data Processing, Feb. 12-13 in Orlando, FL and Mar. 12-13 in St. Louis, MO.

For information, call: 202-833-4100.



**TEXAS
INSTRUMENTS
TI-99/4 HOME
COMPUTER**
99/4 Console
List \$950.
Our Price **\$845.**

13" Color Monitor List \$450.
Our Price **\$419.**

PASCAL LANGUAGE SYSTEM

Our Price **\$438.**
10 Megabyte Corvus Drive **\$4,519.**

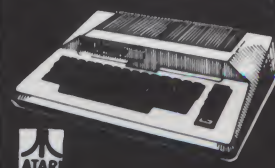


**APPLE II
COMPUTER™**
Apple II (16K)

Our Price **\$974.**
Apple Disc II
w/Controller
Our Price **\$520.**

MICROPOLIS DRIVES

1041 - MOD II	LIST \$1045.00	OUR PRICE \$ 979.00
1043 - MOD II	LIST \$1145.00	OUR PRICE \$1069.00
1053 - MOD II	LIST \$1895.00	OUR PRICE \$1769.00
1021 - MOD II	LIST \$ 545.00	OUR PRICE \$ 509.00
1023 - MOD II	LIST \$ 645.00	OUR PRICE \$ 599.00
1033 - MOD II	LIST \$1395.00	OUR PRICE \$1299.00



**ATARI PERSONAL
COMPUTER
SYSTEMS**
Atari 400 (8K)

Our Price **\$499.**
800 (8K) Our Price **\$899.**

For Other Equipment Not Listed
Please Call For Our Special Price. (301) 336-7710

SYSTEMS-GO
SMALL COMPUTER SPECIALISTS

P.O. Box 146
Columbia, MD 21045

If North Star or Cromemco offer it . . .

WE HAVE IT!!

Immediate Delivery at Discount Prices



NORTH STAR Horizon® 2

32K Double Density
Assembled and Tested
List \$3095

ONLY \$2619

North Star KIT products have been discontinued. MiniMicroMart HAS INVENTORY of most items!

KITS

HORIZON 1 16K, DD . . \$1474
32K, DD, List \$1999 . . . 1684
32K, QD, List \$2199 . . . 1869
HORIZON 2, 16K, DD . . \$1824
32K, DD, List \$2399 . . . 2034
32K, QD, List \$2779 . . . 2359

ASSEMBLED

HORIZON 1, DD \$2279
32K, QD, List \$2995 . . . 2539
HORIZON 2, 32K, DD . . \$2619
32K, QD, List \$3595 . . . 3049
48K, DD, List \$3590 . . . 3039
48K, QD, List \$4090 . . . 3469
64K, DD, List \$3830 . . . 3239
64K, QD, List \$4330 . . . 3669

NORTH STAR APPLICATIONS SOFTWARE

(Exclusive for use with North Star Disk Systems — specify Double or Quad Density)

NORTHWORD, List \$399 \$339
MAILMANAGER, List \$299 249
INFOMANAGER, List \$499 419
GENERALLEDGER, List \$999 799
ACCOUNTSRECEIVABLE, List \$599 499
ACCOUNTSPAYABLE, List \$599 499

NORTH STAR HARD DISK HD-18

18 megabytes, plugs into parallel port of North Star Horizon. Utilizes tried-and-proven 14" Century Data Marksman. List \$4999.

OUR PRICE \$4199

NORTH STAR MDS-A — Double (or Quad) Density Disk System, Kit, List \$799 . **OUR PRICE \$669**
Assembled and Tested, List \$899 **SPECIAL \$719**

NORTH STAR MEMORY BOARDS

16K Dynamic RAM (RAM-16-A/A), Assembled, List \$499 . . . \$420
Kit, List \$449 **SPECIAL \$299**
32K (RAM-32/A), Assembled, List \$739 \$620
Kit, List \$669 **ONLY \$499**

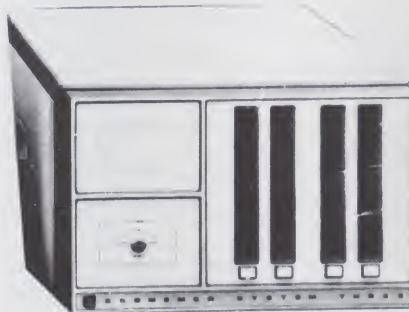
SHIPPING AND INSURANCE: Add \$15 or Horizons, \$2.50 for Boards and Software. Hard Disk Systems and Cromemco systems shipped freight collect. Advertised prices are for prepaid orders. Credit card and C.O.D. 2% higher. Deposit may be required on C.O.D. All prices subject to change and offers subject to withdrawal without notice.

— WRITE FOR FREE CATALOG —

MiniMicroMart, Inc.

1618 James Street, Syracuse, NY 13203 (315) 422-4467

TWX 710-541-0431



CROMEMCO System 3

with 64K of RAM
List \$6990

**OUR PRICE
\$5890**

CROMEMCO SYSTEM 2 — Now features dual-sided drives — double the capacity. Similar to System 3, except features dual, double-sided mini floppy disk drives. List \$3990 **ONLY \$3390**

Z-2 COMPUTER SYSTEM (can be rack mounted), List \$995 **\$845**

SINGLE CARD COMPUTER — SCC-W
4 MHz. List \$450 **\$382**

NEW COLOR GRAPHICS INTERFACE — SDI
List \$595 **OUR PRICE ONLY \$505**

CROMEMCO HDD — 11/22-megabyte Hard Disk for use with existing systems. DMA controller. Transfer rate of 5.6 megabytes/second.

HDD-11, List \$6995 **OUR PRICE ONLY \$5939**
HDD-22, List \$11,995 **\$10,189**

CROMEMCO Z-2H Full 11-megabyte Hard Disk system. Fast Z-80A 4 MHz processor, two floppy disk drives, 64K RAM memory, RS232 special interface, printer interface, and extensive software available. List \$9995



OUR PRICE \$8489



CLASSIFIEDS

Classified advertisements are intended for use by persons desiring to buy, sell or trade used computer equipment. No commercial ads are accepted.

Two sizes of ads are available. The \$5 box allows up to 5 lines of about 35 characters per line, including spaces and punctuation. The \$10 box allows up to 10 lines. Minimize use of capital letters to save space. No special layouts allowed. Payment is required in advance with ad copy. We cannot bill or accept credit.

Advertising text and payment must reach us 60 days in advance of publication (i.e., copy for March issue, mailed in February, must be here by Jan. 1). The publisher reserves the right to refuse questionable or inapplicable advertisements. Mail copy with payment to: **Classifieds, Kilobaud Microcomputing, Peterborough NH 03458.** Do not include any other material with your ad as it may be delayed.

For Sale: D. C. Hayes Micromodem for Apple II. Almost new, works fine! Only \$320. Contact: H. Rothman, 218 Huntington Road, Bridgeport, CT 06608. 203-579-0472.

Super Elf computer with supply, cabinet, memory saver, CMOS RAM, low address display, expandable (\$185 value), \$90. Peter Marcus, 10225 Coral Way, Apt. B122, Miami, FL 33165.

Sale: Xitan Z80 system 48K RAM, 2 Micropolis disks, 630K online, Lear Siegler ADM-3A terminal, software, manuals, like new, \$4100. Call 914-357-8482.

For Sale: SWTPC 6800 complete system. Including: 24K memory, EPROM programmer MP-S, SWTBUG, CFM-3 (ROM), SWTP 4K and 8K BASICs, TSC BASIC, Assembler/Editor, Disassembler, CT-64, AC-30, MPC, PR-40, manual, spare chassis and cards, much more. A \$2000 value for only \$1000. Contact: Les Asher, 203-847-9000.

Sale: Look into your SS-50 micro with Percom's Electric Window, includes 2516 EPROM. \$210 ppd., USA. Victor Kola, 2360 LK George Dr., Anchorage, AK 99504.

PDP-11/20 minicomputer—20K core memory total with expansion box (Plessey) and DLV-II console interface. Full set of documentation, diagnostic paper tapes, Pal-11, ED-11 and BASIC. \$1700. Bill Beckett, 77 Clinton St., Framingham, MA 01701 or 617-879-0268.

For Sale: Heath H8 8K memory boards. Four at \$110 each ppd. Removed due to memory expansion. Louis Berry, 2259 N. Marter Ct., Simi Valley, CA 93065. (805) 522-3599, eves.

OSI CIP-MF-20K RAM. 5 1/4" disk drive. Much software. 1 yr. old. Over \$1300 invested. Moving to larger system. Asking \$950 or ? D. Lockwood, 9045 Park Meadows Dr., Elk Grove, CA 95624.

For Sale: 16K Level II TRS-80 w/keyboard, new, under warranty, \$699. Contact John Abraham or Joe Gutierrez, PO Box 3945, McAllen, TX 78501. 512-687-2329 or 512-682-6731.

Ohio Scientific CIP, extra documentation and demo tape, \$295. Ten high quality CIP programs, Backgammon (8K), Super Monitor, Starfighter, Slashball, Breakthrough, Hangman, Concentration, Tank Battle, Killerbot and Compress; \$45. Goldstar TV/monitor; \$85. All like new, all for \$395. 1 pay postage (USA). Write: Jerry Travis, 8533 Pacific Hwy SE, Olympia, WA 98503.

For Sale: Data Processing Service Bureau in Colorado mountain and ski town. Sale includes Pertec PCC 2000 computer, NEC printer, desk, established customers, prospect list. Software for Word Processing, G. Ledger, Payroll, Job Cost, Acc. Receivable, Acc. Payable, Mailing Lists. Contact Ken Hampton, PO Box 282, Crested Butte, CO 81224 or call 303-349-6203.

Altair dual disk drives with controller and EPROM boot boards. Drives just back from factory overhaul. All for \$1500. Original cost over \$3000. Dick Whipple, 305 Clemson Dr., Tyler, TX 75703. 214-561-1648.

SWTPC/S100 PR-40, \$180; 3 Godbout Econoram II, \$110 ea.; adapter SS50 bus to S100 bus, see Nov. '78 *Kilobaud*, \$15. Call Mike Witte, work 901-345-6222 or home 901-795-5122.

For Sale: Micromation Megabox. Two double-density drives. Disk controller for S100 bus. New/never used. Cost \$2300. Will sell for \$1800 or best offer. Jim Fritz, 1413 Harmony Lane, Annapolis, MD 21401, 301-757-7019.

For Sale: AJ 841 I/O serial printer includes everything needed to use with TRS-80. Also lowercase kit. R. Clore, 2711 Hatch Rd., Jackson, MI 49201. 517-563-2978.

For Sale: S-100 equipment. BIOTECH CGS-80 color graphics board, 7K—2114 & 8085 on board—\$275. 16K—250 ns. 2114 RAM board—\$275. 8K Piceon EPROM programmer board w/8-clean 2708s—\$200. North Star MDS disk system w/10 disks; DOS, BASIC, XEK assembler and much more—\$500. Five 8K—2102 RAM boards—\$80 ea. 16-slot S-100 mainframe w/15 connectors, Mits front panel, 2SIO serial interface and CPU—\$350. Bonus—\$1950 takes everything plus a Datapoint 3300P, 300 baud, thermal printer; 80 column with T1 silent 700 paper. Guarantee all for 30 days. Dave Valliere, 207 Edgewood Dr., Wilmington, DE 19809. 302-764-7210.

Leedex 100 Video Monitor, excellent condition, \$100 or best offer. C1P tapes, assorted OSI and Aardvark, retail \$128—all for \$90. Barry Beal, RFD Box 160, Machias, ME 04654.

For Sale: Unused Polymorphic System 8813 with 32K RAM memory with floppy-disk drives, printer interface and Abern-Sopher Multiwriter III. System has Canadian import tax paid. Offers for complete system to: Bishop Management, #8—825 McBride Blvd., New Westminster, B.C., Canada, V3L 5B5. 604-525-8148.

Wanted: IC chip, type #SW-10667, used in Diablo 1622 daisy-wheel printer. Jim Jamison, 2304 Tucker, Suncoast, N. Ft. Myers, FL 33903.

Soroc IQ 140 terminal in original box, \$995. IBM Electric 731 I/O, \$450. Bob Flaming, 6519 Jetta Ave., Bakersfield, CA 93308. 805-399-8968.

Amateur radio—Macrotronics TRS-80 RTTY system—M80, M800 hardware. Software—tapes—manuals & bulletins, \$130. Write: Al Hubbard, 5705 Junonia, SPV, Fort Myers, FL 33908.

For Sale: Datapoint 3300P thermal printer, 80 column, RS-232 serial input at 300 baud. Uses T1 745 paper. Case is 15" x 14" x 5" and color matches "Apple." Quiet, reliable and attractive printer. 30 day guarantee. \$500, freight collect, \$550 w/Apple serial interface. Dave Valliere, 207 Edgewood Dr., Wilmington, DE 19809. 302-764-7210.



Not to worry, sir. I've seen worse than this.

CORRECTIONS

The left brackets (l) that appear in the "Orbiter" listings (May 1980, pp. 112, 113) should be up-arrows.

For 16K machines, the last two digits in the "POKE" line of Ronald Foulis's letter (June 1980, p. 225) should be the three digits 127.

The digits in line 120 of Al Joffe's program listing on page 32 of the September 1979 issue should be 9144, not 9114.

Gary Sabot, author of "You Name It!" (May 1980), writes: In the two years since I wrote the article, the version of BASIC I used has become obsolete. In order for the program to run on any version of Microsoft BASIC (such as MBASIC and Radio Shack Level II), a small change must be made. Wherever the old program has "MID(. . ." you must substitute "MID\$(. . .)". Lines 190, 200 and 210 must be changed in this way.

Allan Domuret writes that there is a typo in Example 2 of his article "Uppercase Lowercase Utility for the TRS-80" (March 1980). The POKEs to decimal memory references 16512, 16513 and 16514 should read 16408, 16409 and 16410, respectively. The hex references to &H4018, &H4019 and &H401A are correct as shown.

Author of "Lowercase for the TRS-80," Steven Wexler, let us know that there is an error in his listing. The next to the last line should read, in part: 7FFA D2,7D,04. The second element is D2, not 02.

This is not a correction; it is just a note that the list of sources of educational software on page 105 of "Bringing Microcomputers into Schools" (June 1980) was not meant to include all sources.

Chesney Twombly, author of "8080 Program Loader/Relocator" (April 1980), wants to add the following note to his article: The TSC 8080 Relocator program will run on an H8 using CONOPS if you remember to change the addresses of external routine jumps to read as follows:

431F	C3	DB	6E	MONITR	JMP	MONIT
4322	C3	1D	6C	INCH	JMP	INCHR
4325	C3	67	20	OUTCH	JMP	WCHAR

Robert Penoyer, author of "Accurate Voltage Dividers" (April 1980), has informed us that the last sentence of the second complete paragraph on page 143 should finish: "3900 Ohms and 12 Ohms," not "3900 Ohms and 1200 Ohms."

CBM CERTIFIED
In-House Maintenance

ALL UNDER
29 years
ONE ROOF

Serving Computer Centers

FAMILY OWNED & OPERATED
(even "no-relation" associates are family)

DOWNEY, CA.
(213) 923-9361

DES

Data Equipment Supply Corp.
8315 Firestone Blvd., Downey, CA 90241



SOLID GOLD SOFTWARE®

DES's own—2 years preparation! Writing, testing and updating to be sure our software deserves this label.

- **FULL ACCT. PACKAGE** \$1600.00
ACC/SYS GA 104 (32K) 9 DISKS

For accountants & small businesses

(Sold locally only for now—to give customer full support)

- **LAWYERS Package #1** (32K) Disk... \$1200.00
63 Attorneys, 5200 clients (200 matters ea)
Prelim & Final Statements, Aging, Mgmt Rpts
- **CHEMISTRY PROFILE** (16K) \$350.00
A blood analysis program that yields a diagnosis based on 29 blood tests (high-normal-low)
- **MLS** (32K min.) Disk \$1200.00
(Property avail, sold, by city & zone, mg'mt analyst rpts, buyer & seller rpts, etc.)

"GOLD PLATED SOFTWARE®"

SPORTS

- **HOCKEY #1** (Disk) \$29.95
Compiler for hockey statistics—excellent for team and league managers. (When tested on a 17 team league SAVED 20 hours a week of record keeping)
- **BASEBALL #1** (see Hockey) (Disk) \$29.95

BUSINESS

- **MAILING LIST 1.0** (16K min.) \$29.95
Maintains file and printout
- **MAILING LIST 2.0** (16K min.) \$49.95
More powerful plus file merging
- **SUPER LIST** (8K min.) \$19.95
(Advanced listing features)
- **CALENDAR** (8K min.) \$19.95
(Perpetual calendar with printout)
- **PHONE MAIL SYSTEM** (16K min.)... \$49.95
CBM Printer (Word processing plus phone book)

EDUCATIONAL

- **FLASH CARDS** (16K min.) \$24.95
Multi "user input" quiz - great study aid
- **MATHEMATICS** (8K min.) \$7.95 ea
A) Add B) Subt C) Multi D) Div
- **"BRANDI'S SPELLING BEE"** (8K min)... \$9.95
(SUPERB Aid Pre-School - 2nd)
- **VISUAL PERCEPTION** (8K min) \$7.95
Shapes & Sizes
- **CONSONANT BLENDS** (8K min) \$7.95
2 letter sound combinations
- **COUNTING 1 to 9** (8K min.) \$7.95
Visual - tutorial

GAMES

- **MAY 1941** (8K min.) \$24.95
Simulated tracking & sinking of the Bismarck
- **SIMON** (8K min.) \$7.95
Duplicates the numbers & sounds selected
- **GUESS??** (8K min.) \$7.95
Full graphic sound, guessing game

★ "The Finest Software Crew in the World" ★
Mike Richter/Norm & Brad Hanscom/Sy Elsayess
David Schwartz/Donna Schlieper/Bob Johnson
Dave Lundberg/Murat Kalinyaprak/Henry Kluka

SUPPLIES

(WE PLAN, WITH OUR PRICES, TO CORNER THE MARKET!)

DISKETTES (FLOPPIES)

- BASF (5¼" & 8") \$2.90 ea.
- MEMOREX (5¼" & 8") 2.90 ea.
- WABASH (8") 2.65 ea.
- DYSAN (5¼" & 8") 4.90 ea.

CASSETTES (Digital & Audio)

- BASF (C30 - .90¢; C60 - \$1.20;
C90 - \$1.50; C120 - \$1.75)

KEYLINE (Digital Only) \$5.75

RIBBONS

CENTRONICS

- 101 & 301 \$6.15
- TALLY (2100 & 2200) \$3.95

DIABLO

- Hy Type I \$4.00 & up
- Hy Type II \$5.00 & up

TELETYPE #2, #13 (use on CBM) \$2.95

QUME \$3.95

PRINTRONICS \$10.25

DEC LA30 - \$4.25 / LA180 \$5.25

PRINTER PAPER (✓ us for case prices)

- 9½ x 11 (perfs to 8½ x 11) 500 shts \$7.95
- 14½ x 11 500 shts \$9.95

Your Complete Computer Center

—SEND FOR DESCRIPTIVE BROCHURES—
ALL AVAILABLE ENGLISH/ARABIC

DES **DATA EQUIPMENT SUPPLY CORP.**
8315 Firestone Blvd., Downey, CA 90241
✓ 293 (213) 923-9361

PAYMENT (Calif. Residents add 6% Sales Tax)

☐ CHECK # _____

☐ VISA

☐ MASTERCHARGE Exp. Date _____

Acct. # _____

Name _____

Address _____

City _____

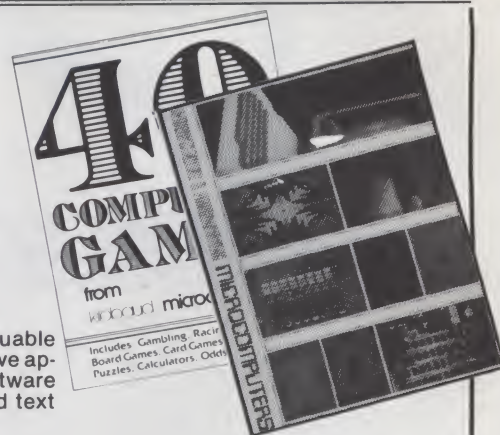
State _____ Zip _____

kb microcomputing book nook

2 NEW BOOKS FROM KB MICROCOMPUTING

● **40 COMPUTER GAMES**—BK7381—Forty games in all in nine different categories. Games for large and small systems, and even a section on calculator games. Many versions of BASIC used and a wide variety of systems represented. A must for the serious computer gamesman. \$7.95*

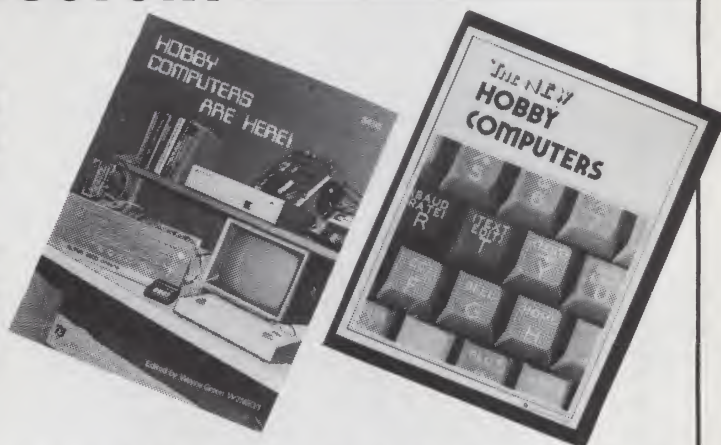
● **UNDERSTANDING AND PROGRAMMING MICROCOMPUTERS** —BK7382—A valuable addition to your computing library. This two part text includes the best articles that have appeared in 73 and Kilobaud Microcomputing magazines on the hardware and software aspects of the new microcomputing hobby. Well known authors and well structured text helps the reader get involved in America's fastest growing hobby. \$10.95*



INTRODUCTORY

● **HOBBY COMPUTERS ARE HERE!**—BK7322—If you (or a friend) want to come up to speed on how computers work... hardware and software... this is an excellent book. It starts with the fundamentals and explains the circuits, and the basics of programming. This book has the highest recommendations as a teaching aid for newcomers. \$4.95.*

● **THE NEW HOBBY COMPUTERS**—BK7340—This book takes it from where "HOBBY COMPUTERS ARE HERE!" leaves off, with chapters on Large Scale Integration, how to choose a microprocessor chip, an introduction to programming, low cost I/O for a computer, computer arithmetic, checking memory boards... and much, much more! Don't miss this tremendous value! Only \$4.95.*



INTRODUCTION TO MICROCOMPUTERS (VOL. 0→III)

● **AN INTRODUCTION TO MICROCOMPUTERS, VOL. 0**—BK1130—The Beginner's Book—Written for readers who know nothing about computers—for those who have an interest in how to use computers—and for everyone else who must live with computers and should know a little about them. The first in a series of 4 volumes, this book will explain how computers work and what they can do. Computers have become an integral part of life and society. During any given day you are affected by computers, so start learning more about them with Volume 0. \$7.95.*

● **VOL. I**—BK1030—2nd Edition completely revised. Dedicated to the basic concepts of microcomputers and hardware theory.

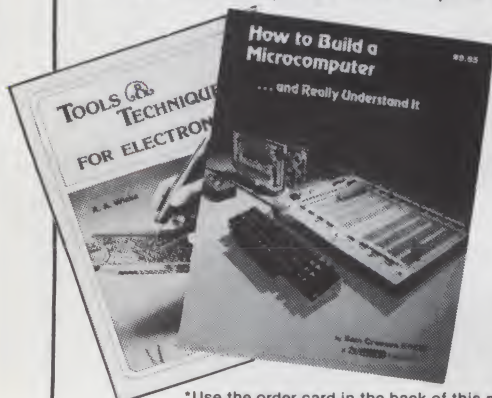
The purpose of Volume I is to give you a thorough understanding of what microcomputers are. From basic concepts (which are covered in detail), Volume I builds the necessary components of a microcomputer system. This book highlights the difference between minicomputers and microcomputers. \$12.50.*

● **VOL. II**—BK1040 (with binder)—\$30.00*—Contains descriptions of individual microprocessors and support devices used only with the parent microprocessor. Volume II describes all available chips.

● **VOL. III**—BK1133 (with binder)—\$20.00.* Contains descriptions of all support devices that can be used with any microprocessor.

● **HOW TO BUILD A MICROCOMPUTER—AND REALLY UNDERSTAND IT**—BK7325—by Sam Creason. The electronics hobbyist who wants to build his own microcomputer system now has a practical "How-To" guidebook. This book is a combination technical manual and programming guide that takes the hobbyist step-by-step through the design, construction, testing and debugging of a complete microcomputer system. Must reading for anyone desiring a true understanding of small computer systems. \$9.95.*

● **TOOLS & TECHNIQUES FOR ELECTRONICS**—BK7348—is an easy-to-understand book written for the beginning kit builder as well as the experienced hobbyist. It has numerous pictures and descriptions of the safe and correct ways to use basic and specialized tools for electronic projects as well as specialized metal working tools and the chemical aids which are used in repair shops. \$4.95.*

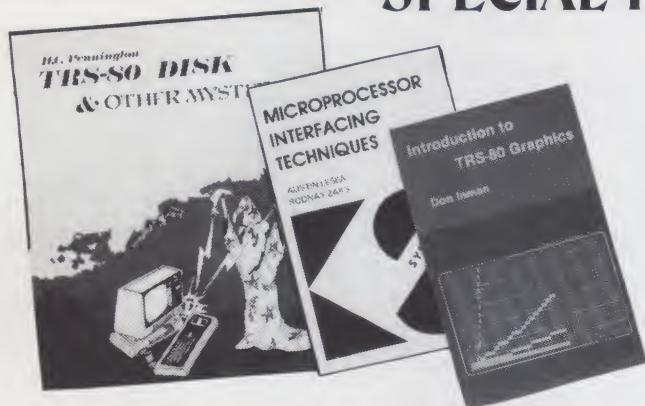


*Use the order card in the back of this magazine or itemize your order on a separate piece of paper and mail to Kilobaud Microcomputing Book Department • Peterborough NH 03458. Be sure to include check or detailed credit card information. No C.O.D. orders accepted. All orders add \$1.00 handling. Please allow 4-6 weeks for delivery. Questions regarding your order? Please write to Customer Service at the above address.

FOR TOLL FREE ORDERING CALL 1-800-258-5473

kb microcomputing book nook

SPECIAL INTERESTS



● **TRS-80 DISK AND OTHER MYSTERIES**—BK1181—by Harvard C. Pennington. This is the definitive work on the TRS-80 disk system. It is full of detailed "How to" information with examples, samples and in-depth explanations suitable for beginners and professionals alike. The recovery of one lost file is worth the price alone. \$22.50.*

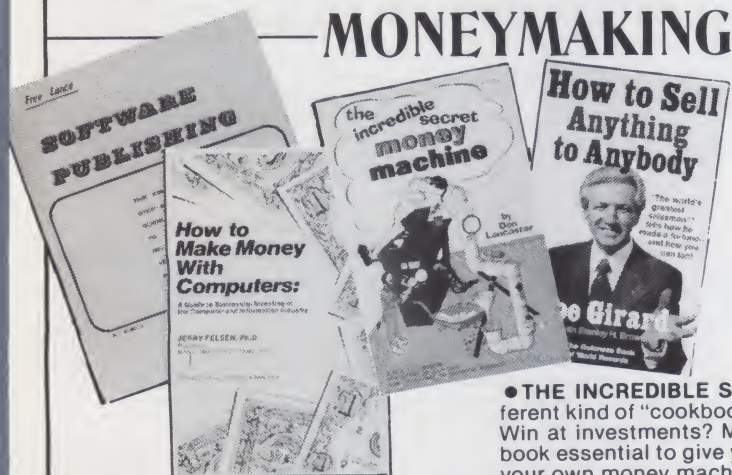
● **INTRODUCTION TO TRS-80 GRAPHICS**—BK1180—by Don Inman. Dissatisfied with your Level I or Level II manual's coverage of graphics capabilities? This well-structured book (suitable for classroom use) is ideal for those who want to use all the graphics capabilities built into the TRS-80. A tutorial method is used with many demonstrations. It is based on the Level I, but all material is suitable for Level II use. \$8.95.*

● **MICROPROCESSOR INTERFACING TECHNIQUES**—BK1037—by Austin Lesea & Rodney Zaks will teach you how to interconnect a complete system and interface it to all the usual peripherals. It covers hardware and software skills and techniques, including the use and design of model buses such as the IEEE 488 or S100. \$15.95.*

● **MICROPROCESSOR LEXICON—ACRONYMS AND DEFINITIONS**—BK1137—Compiled by the staff of SYBEX is a convenient reference in pocket size format. Sections include acronyms and definitions, part numbers and their definitions, S-100 signals, RS232 signals, IEEE 499 signals, microcomputer and microprocessors, JETDS summary (military) and a code conversion table. \$2.95.*

● **MICROPROCESSORS FROM CHIPS TO SYSTEMS**—BK1036—by Rodney Zaks is a complete and detailed introduction to microprocessors and microcomputer systems. No preliminary knowledge of computers or microprocessors is required to read this book, although a basic engineering knowledge is naturally an advantage. Intended for all wishing to understand the concepts, techniques and components of microprocessors in a short time. \$9.95.*

MONEYMAKING



● **HOW TO MAKE MONEY WITH COMPUTERS**—BK1003—In 10 information-packed chapters, Jerry Felsen describes more than 30 computer-related, money-making, high profit, low capital investment opportunities. \$15.00.*

● **HOW TO SELL ANYTHING TO ANYBODY**—BK7306—According to *The Guinness Book of World Records*, the author, Joe Girard, is "the world's greatest salesman." This book reveals how he made a fortune—and how you can, too. \$2.25.*

● **FREELANCE SOFTWARE PUBLISHING**—BK1179—by B. J. Korites. "This book is about money and how to make it by writing and selling computer programs," (author's foreword). If you have the skills to write a saleable program, you now need to acquire the skills to sell that program. This compact book comprehensively covers the entire publishing process and many aspects of software salesmanship. \$14.95.*

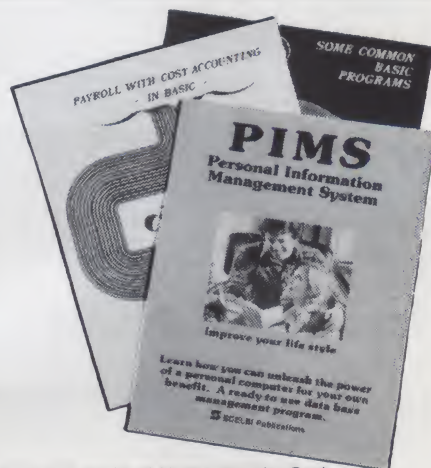
● **THE INCREDIBLE SECRET MONEY MACHINE**—BK1178—by Don Lancaster. A different kind of "cookbook" from Don Lancaster. Want to slash taxes? Get free vacations? Win at investments? Make money from something that you like to do? You'll find this book essential to give you the key insider details of what is really involved in starting up your own money machine. \$5.95.*

BUSINESS

● **PAYROLL WITH COST ACCOUNTING—IN BASIC**—BK1001—by L. Poole & M. Borchers, includes program listings with remarks, descriptions, discussions of the principle behind each program, file layouts, and a complete user's manual with step-by-step instructions, flowcharts, and simple reports and CRT displays. Payroll and cost accounting features include separate payrolls for up to 10 companies, time-tested interactive data entry, easy correction of data entry errors, job costing (labor of distribution), check printing with full deduction and pay detail, and 16 different printed reports, including W-2 and 941 (in CBASIC). \$20.00.*

● **SOME COMMON BASIC PROGRAMS**—BK1053—published by Adam Osborne & Associates, Inc. Perfect for non-technical computerists requiring ready-to-use programs. Business programs, plus miscellaneous programs. Invaluable for the user who is not an experienced programmer. All will operate in the stand-alone mode. \$12.50 paperback.*

● **PIMS: PERSONAL INFORMATION MANAGEMENT SYSTEM**—BK1009—Learn how to unleash the power of a personal computer for your own benefit in this ready-to-use data-base management program. \$11.95.*

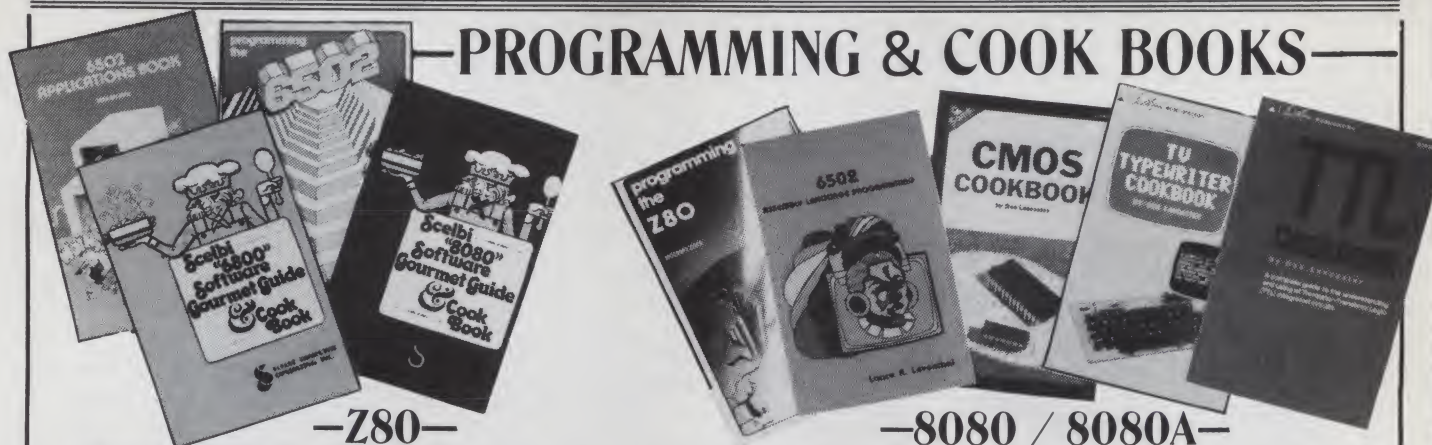


*Use the order card in the back of this magazine or itemize your order on a separate piece of paper and mail to Kilobaud Microcomputing Book Department • Peterborough NH 03458. Be sure to include check or detailed credit card information. No C.O.D. orders accepted. All orders add \$1.00 handling. Please allow 4-6 weeks for delivery. Questions regarding your order? Please write to Customer Service at the above address.

FOR TOLL FREE ORDERING CALL 1-800-258-5473

kb microcomputing book nook

—PROGRAMMING & COOK BOOKS—



—Z80—

● **PROGRAMMING THE Z-80**—BK1122—by Rodnay Zaks. Here is assembly language programming for the Z-80 presented as a progressive, step-by-step course. This book is both an educational text and a self-contained reference book, useful to both the beginning and the experienced programmer who wish to learn about the Z-80. Exercises to test the reader are included. \$14.95.*

● **Z-80 ASSEMBLY LANGUAGE PROGRAMMING**—BK1177—by Lance A. Leventhal. This book thoroughly covers the Z80 instruction set, abounding in simple programming examples which illustrate software development concepts and actual assembly language usage. Features include Z80 I/O devices and interfacing methods, assembler conventions, and comparisons with 8080A/8085 instruction sets and interrupt structure. \$12.50.*

● **Z-80 SOFTWARE GOURMET GUIDE AND COOKBOOK**—BK1045—by Nat Wadsworth. Scelbi's newest cookbook! This book contains a complete description of the powerful Z-80 instruction set and a wide variety of programming information. Use the author's ingredients including routines, subroutines and short programs, choose a time-tested recipe and start cooking! \$15.95.*

—6502—

● **PROGRAMMING THE 6502 (Second Edition)**—BK1005—Rodnay Zaks has designed a self-contained text to learn programming, using the 6502. It can be used by a person who has never programmed before, and should be of value to anyone using the 6502. The many exercises will allow you to test yourself and practice the concepts presented. \$12.95.*

● **6502 APPLICATIONS BOOK**—BK1006—Rodnay Zaks presents practical-application techniques for the 6502 microprocessor, assuming an elementary knowledge of microprocessor programming. You will build and design your own domestic-use systems and peripherals. Self-test exercises included. \$12.95.*

● **6502 ASSEMBLY LANGUAGE PROGRAMMING**—BK1176—by Lance A. Leventhal. This book provides comprehensive coverage of the 6502 microprocessor assembly language. Leventhal covers over 80 programming examples from simple memory load loops to complete design projects. Features include 6502 assembler conventions, input/output devices and interfacing methods, and programming the 6502 interrupt system. \$12.50.*

● **6502 SOFTWARE GOURMET GUIDE AND COOKBOOK**—BK1055—by Robert Findley. This book introduces the BASIC language programmer into the realm of machine-language programming. The description of the 6502 structure and instruction set, various routines, subroutines and programs are the ingredients in this cookbook. "Recipes" are included to help you put together exactly the programs to suit your taste. \$12.95.*

—8080 / 8080A—

● **8080A/8085 Assembly Language Programming**—by Lance Leventhal—BK1004—Assembly language programming for the 8080A/8085 is explained with a description of the functions of assemblers and assembly instructions, and a discussion of basic software development concepts. Many fully debugged, practical programs are included as is a special section on structured programming. \$12.50.*

● **8080 PROGRAMMING FOR LOGIC DESIGN**—BK1078—Ideal reference for an indepth understanding of the 8080 processor. Application-oriented and the 8080 is discussed in light of replacing conventional, hard-wired logic. Practical design considerations are provided for the implementation of an 8080-base control system. \$9.50.*

● **8080 SOFTWARE GOURMET GUIDE AND COOKBOOK**—BK1102—If you have been spending too much time developing simple routines for your 8080, try this new book by Scelbi Computing and Robert Findley. Describes sorting, searching, and many other routines for the 8080 user. \$12.95.*

—6800—

● **6800 PROGRAMMING FOR LOGIC DESIGN**—BK1077—Oriented toward the industrial user, this book describes the process by which conventional logic can be replaced by a 6800 microprocessor. Provides practical information that allows an experimenter to design a complete micro control system from the "ground up." \$9.50.*

● **6800 SOFTWARE GOURMET GUIDE AND COOKBOOK**—BK1075—Like its culinary cousin, *The 8080 Gourmet Guide*, this book by Scelbi Computing and Robert Findley describes sorting, searching and other routines—this time for the 6800 user. \$12.95.*

—COOK BOOKS—

● **CMOS COOKBOOK**—BK1011—by Don Lancaster. Details the application of CMOS, the low power logic family suitable for most applications presently dominated by TTL. Required reading for every serious digital experimenter! \$10.50.*

● **TVT COOKBOOK**—BK1064—by Don Lancaster. Describes the use of a standard television receiver as a microprocessor CRT terminal. Explains and describes character generation, cursor control and interface information in typical, easy-to-understand Lancaster style. \$9.95.*

● **TTL COOKBOOK**—BK1063—by Donald Lancaster. Explains what TTL is, how it works, and how to use it. Discusses practical applications, such as a digital counter and display system, events counter, electronic stopwatch, digital voltmeter and a digital tachometer. \$9.50.*

● **MICROCOMPUTING CODING SHEETS** *Microcomputing's* dozen or so programmers wouldn't try to work without these handy scratch pads, which help prevent the little errors that can cost hours and hours of programming time. Available for programming in Assembly/Machine Language (PD1001), which has columns for address, instruction (3 bytes), source code (label, op code, operand) and comments; and for BASIC (PD1002) which is 72 columns wide. 50 sheets to a pad. \$2.39.*

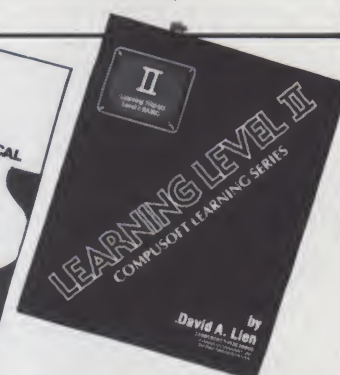
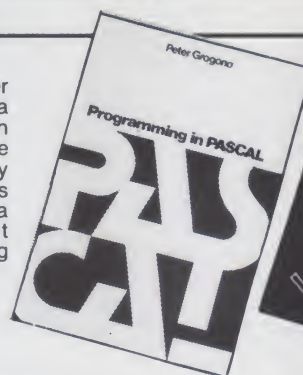
*Use the order card in the back of this magazine or itemize your order on a separate piece of paper and mail to Kilobaud Microcomputing Book Department • Peterborough NH 03458. Be sure to include check or detailed credit card information. No C.O.D. orders accepted. All orders add \$1.00 handling. Please allow 4-6 weeks for delivery. Questions regarding your order? Please write to Customer Service at the above address.

FOR TOLL FREE ORDERING CALL 1-800-258-5473

kb microcomputing book nook

BASIC AND PASCAL

● **PROGRAMMING IN PASCAL**—BK1140—by Peter Grogono. The computer programming language PASCAL was the first language to embody in a coherent way the concepts of structured programming, which has been defined by Edsger Dijkstra and C.A.R. Hoare. As such, it is a landmark in the development of programming languages. PASCAL was developed by Niklaus Wirth in Zurich; it is derived from the language ALGOL 60 but is more powerful and easier to use. PASCAL is now widely accepted as a useful language that can be efficiently implemented, and as an excellent teaching tool. It does not assume knowledge of any other programming language; it is therefore suitable for an introductory course. \$12.95.*



● **THE BASIC HANDBOOK**—BK1174—by David Lien. This book is unique. It is a virtual ENCYCLOPEDIA of BASIC. While not favoring one computer over another, it explains over 250 BASIC words, how to use them and alternate strategies. If a computer does not possess the capabilities of a needed or specified word, there are often ways to accomplish the same function by using another word or combination of words. That's where the HANDBOOK comes in. It helps you get the most from your computer, be it a "bottom-of-the-line" micro or an oversized monster. \$14.95.*

● **LEARNING LEVEL II**—BK1175—by David Lien. Written especially for the TRS-80, this book concentrates on Level II BASIC, exploring every important BASIC language capability. Updates are included for those who have studied the Level I User's Manual. Sections include: how to use the Editor, dual cassette operation, printers and peripheral devices, and the conversion of Level I programs to Level II. \$15.95.*

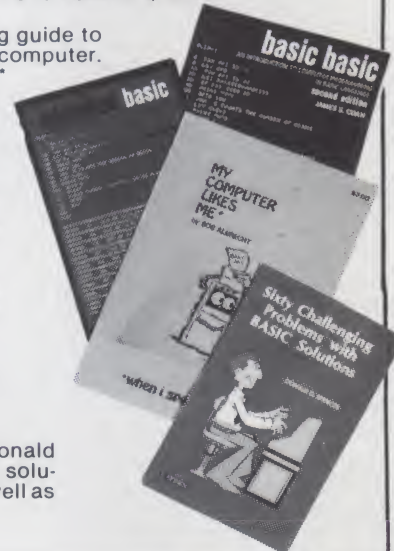
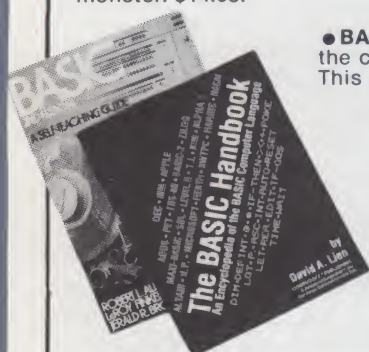
● **BASIC NEW 2ND EDITION**—BK1081—by Bob Albrecht. Self-teaching guide to the computer language you will need to know for use with your microcomputer. This is one of the easiest ways to learn computer programming. \$6.95.*

● **BASIC BASIC (2ND EDITION)**—BK1026—by James S. Coan. This is a textbook which incorporates the learning of computer programming using the BASIC language with the teaching of mathematics. Over 100 sample programs illustrate the techniques of the BASIC language and every section is followed by practical problems. This second edition covers character string handling and the use of data files. \$9.45.*

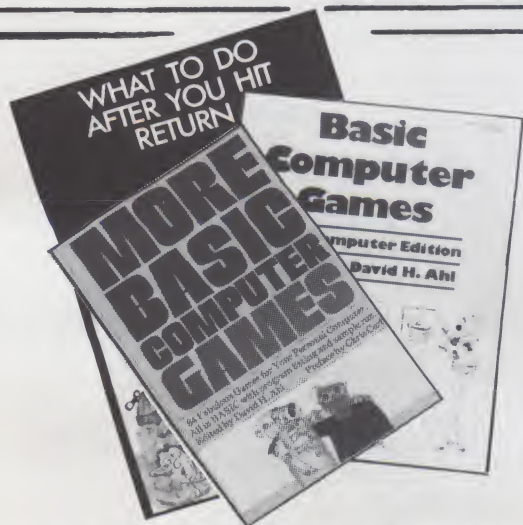
● **ADVANCED BASIC**—BK1000—Applications, including strings and files, coordinate geometry, area, sequences and series, simulation, graphing and games. \$9.65.*

● **MY COMPUTER LIKES ME... WHEN I SPEAK BASIC**—BK1039—An introduction to BASIC... simple enough for kids. If you want to teach BASIC to anyone quickly, this is the way to go. \$2.00.*

● **SIXTY CHALLENGING PROBLEMS WITH BASIC SOLUTIONS (2nd Edition)**—BK1073—by Donald Spencer, provides the serious student of BASIC programming with interesting problems and solutions. No knowledge of math above algebra required. Includes a number of game programs, as well as programs for financial interest, conversions and numeric manipulations. \$6.95.*



GAMES



● **WHAT TO DO AFTER YOU HIT RETURN**—BK1071—PCC's first book of computer games... 48 different computer games you can play in BASIC... programs, descriptions, many illustrations. Lunar Landing, Hammurabi, King, Civel 2, Qubic 5, Taxman, Star Trek, Crash, Market, etc. \$10.95.*

● **BASIC COMPUTER GAMES**—BK1074—Okay, so once you get your computer and are running in BASIC, then what? Then you need some programs in BASIC, that's what. This book has 101 games for you from very simple to real buggers. You get the games, a description of the games, the listing to put in your computer and a sample run to show you how they work. Fun. Any one game will be worth more than the price of the book for the fun you and your family will have with it. \$7.50.*

● **MORE BASIC COMPUTER GAMES**—BK1182—edited by David H. Ahl. More fun in BASIC! 84 new games from the people who brought you *BASIC Computer Games*. Includes such favorites as Minotaur (battle the mythical beast) and Eliza (unload your troubles on the doctor at bargain rates). Complete with game description, listing and sample run. \$7.50.*

new!

*Use the order card in the back of this magazine or itemize your order on a separate piece of paper and mail to Kilobaud Microcomputing Book Department
• Peterborough NH 03458. Be sure to include check or detailed credit card information. No C.O.D. orders accepted. All orders add \$1.00 handling.
Please allow 4-6 weeks for delivery. Questions regarding your order? Please write to Customer Service at the above address.

FOR TOLL FREE ORDERING CALL 1-800-258-5473

LETTERS

(from page 23)

of Parsing, Translation, and Compiling, Volume II: Compiling, Prentice-Hall, Inc., Englewood Cliffs, NJ, 1973 (in particular chapter 11 on Code Optimization).

● Baer, J. L., *Graph Models in Programming Systems*, in "Current Trends in Programming Methodology, Volume III, Software Modeling" (K. M. Chandy and R. T. Yeh, editors), Prentice-Hall, Inc. Englewood Cliffs, NJ, 1978.

● Schaefer, M., *A Mathematical Theory of Global Program Optimization*, Prentice-Hall, Inc., Englewood Cliffs, NJ, 1973.

In response to Mr. Spearman: Listings 5-7 illustrate six programs run under WATFIV-S, G Level FORTRAN IV and PL/I on an IBM 4331. (I would like to thank Larry Oliver of the UMR Computer Center for his assistance.) Similar time savings should be realized when this technique is applied to most compilers (be they on a micro, a mini, or a maxi) if it is able to recognize a constant subscript. If the compiler is not able to determine that the subscript is a constant, then it will treat this array reference the same as it would treat a reference subscripted with a variable.

Warren A. Harrison
Computer Science Dept.
University of Missouri
Rolla, MO 65401

Correction

Before submitting my article, "A Micro for the Eighties" (May 1980), I talked by telephone with a dealer confirming the then-current prices for AlphaMicro products. Since these have been in effect for 18 months, I was concerned about a price increase. At no time did this dealer or another to whom I talked advise me of any change in policy concerning the sales of equipment by AlphaMicro.

I have since called two dealers and AlphaMicro to find that AlphaMicro made a change in marketing policy effective January 1, 1980. Primarily to enhance total system reliability, AlphaMicro Systems no longer sells the AM-100 CPU boards or the disk control boards as separate items. One can only purchase a complete system from AlphaMicro. The minimal system is an AM-100 with double density floppy (but without terminals or printers). The base price is approximately \$10,800.

Some dealers still have AM-100 CPU boards, ordered before the policy change, which they will sell separately for those persons wanting to upgrade an 8080 or Z-8 system.

I am informed that the policy created no small measure of dealer resistance and that many dealers have expressed opposition to the policy. I do not know if this will result in a change—I rather doubt that it will.

Some people at AlphaMicro tell me that the new policy is primarily the result of the introduction of a new and faster CPU called the AM-100-T. Apparently, this CPU stretches

most S-100 motherboards beyond their capabilities. The introduction of the new policy, while making it much more expensive to upgrade to an AlphaMicro system, results in AlphaMicro supplying a complete system which they know will work, instead of struggling with users who have placed an AlphaMicro CPU on a substandard motherboard and with inferior memory.

I deeply regret the inaccuracies appearing in the article. I thought I was going out of my way to avoid problems such as this. Apparently, I did not go far enough or ask the right questions. Frankly, it never dawned on me that AlphaMicro would stop selling individual CPU boards. Again, my apologies.

Wm. C. Welborn, Jr.
Evansville, IN

Praise for Pascal

I was pleased to see the article, "An Introduction to Pascal," by Jim Gagne in the June 1980 issue. Besides introducing the language, it also contains a good sales pitch on the benefits of a structured language.

I feel strongly that new users of microcomputers should be learning Pascal as their first computer language. This would avoid all the bad programming habits that people pick up when starting out with an old-style language, such as BASIC. What is really needed here is a simple low-cost computer with Pascal in ROM. This would mean that whenever you switched the machine on, there would be Pascal, ready to run.

Unfortunately, most of the versions of Pascal that are available for microcomputers are compilers, which require floppy disks and extensive memory. For the beginning programmer, an interpreter is much better because it executes the program lines directly, and requires much less memory. It will be slower, of course, but that is not normally a problem.

As an experiment, I recently wrote an interpreter for Pascal, just to see if it could be done. I simplified standard Pascal slightly, to make it easier to interpret. In particular, there must be one statement per line, and semicolons are not used to separate statements. The indentation of

lower-level statements is compulsory.

I think that having an interpreter such as this on a small appliance-type microcomputer would be a great advance in hobby computing. The version I have now is written in assembly language for a time-sharing computer, but I intend to do it again for my Motorola 6802 microcomputer.

J. Gary Mills
Winnipeg, Man.
Canada

Love That TRS-80

The April 1980 "Publisher's Remarks" indicated interest in the comments of users of microcomputers for business operations.

Our company uses a TRS-80 (Model I) with lowercase mod, 48K RAM, standard 35-track disk drives and a daisy wheel printer.

Although our business volume is suitable for a minicomputer system, we prefer our TRS-80 for a number of reasons.

Most important, we can write our own programs, giving us the flexibility to produce and format data as we wish, and to alter the output as our needs change.

The other reasons have mainly to do with cost savings and convenience. For instance, our office payroll and related expenses have fallen \$24,000/annum, and service is available through a maintenance contract with a local firm. Also, programs such as Electric Pencil enable us to use it for more functions than we had contemplated.

We did experience some reliability problems. Substituting NEWDOS for TRSDOS solved most of them. Others appear to be caused by such things as poor connections developing at the edge card connectors. After some experience we have been able to recognize the causes and eliminate most problems. We notice an increasing number of reliability aids, such as data separators, on the market and we will no doubt be continually upgrading our equipment.

W. K. Wells
Scarborough, Ontario
Canada

REMARKS

(from page 7)

Opportunity Knocketh

Software and hardware may come and go, but one thing goes on, regardless of the changes, and that's publishing. The faster the changes happen, the more need there is for more magazines and books to support the changes. This explains the growth we've experienced with *Kilobaud Microcomputing* and *80 Microcomputing* magazines.

Since it takes people to make this growth happen and continue, we have career spots open, and no end in sight to the projected

growth. If you have any background or desire to apprentice in editing, technical editing, advertising sales, circulation, product testing, programming or any of the other facets of programming, you should let me know. Send me a letter telling me what you think you can do for us and what aspects of your background and experience substantiate that expectation.

Ad Policy

We've received several reader complaints about the recent Interlude ads. This was not unexpected. But we figured that since most readers of this magazine were presumably knowledgeable about sex, censorship of the ad would achieve little.

QUEST

ELECTRONICS

NEW PRODUCTS!

Super Color S-100 Video Kit \$129.95
Expandable to 256 x 192 high resolution color graphics. 6847 with all display modes computer controlled. Memory mapped. 1K RAM expandable to 6K. S-100 bus 1802, 8080, 8085, 280 etc. Delivery January '80.

1802 16K Dynamic RAM Kit \$149.00
Expandable to 32K. Hidden refresh w/clocks up to 4 MHz w/no wait states Addl. 16K RAM \$63

Quest Super Basic

Quest, the leader in inexpensive 1802 systems announces another first. Quest is the first computer worldwide to ship a full size Basic for 1802 systems. A complete function point capability with scientific notation (number range $\pm 1.7E^{+9}$), 32 bit integer ± 2 billion; Multi dim arrays; String arrays; String manipulation; Cassette I/O. Save and load, Basic, Data and machine language programs; and over 75 Statements, Functions and Operators.

Easily adaptable on most 1802 systems. Requires 12K RAM minimum for Basic and user programs. Cassette version in stock now. ROM versions coming soon with exchange privilege

Elf II Adapter Kit \$24.95

Plugs into Elf II providing Super Elf 44 and 50 pin plus S-100 bus expansion. (With Super Expansion). High and low address displays, state and mode LED's optional \$18.00.

Gremlin Color Video Kit \$69.95

32 x 16 alpha/numerics and graphics; up to 8 colors with 6847 chip; 1K RAM at E000. Plugs into Super Elf 44 pin bus. No high res. graphics.

allowing some credit for cassette version. New improved version with improved speed and accuracy now avail. Source list for I/O now incl.

Super Basic on Cassette \$40.00

Tom Pittman's 1802 Tiny Basic Source listing now available. Find out how Tom Pittman wrote Tiny Basic and how to get the most out of it. Never offered before. \$19.00.

S-100 4-Slot Expansion \$9.95

Super Monitor VI.1 Source Listing \$15.00

Coming Soon: Assembler, Editor, Disassembler, DA/AD, Super Sound/Music, EPROM programmer, Stringy Floppy System.



RCA Cosmac Super Elf Computer \$106.95

Compare features before you decide to buy any other computer. There is no other computer on the market today that has all the desirable benefits of the Super Elf for so little money. The Super Elf is a small single board computer that does many big things. It is an excellent computer for training and for learning programming with its machine language and yet it is easily expanded with additional memory, Full Basic, ASCII Keyboards, video character generation, etc.

Before you buy another small computer, see if it includes the following features: ROM monitor; State and Mode displays; Single step; Optional address displays; Power Supply; Audio Amplifier and Speaker; Fully socketed for all IC's; Real cost of in warranty repairs; Full documentation.

The Super Elf includes a ROM monitor for program loading, editing and execution with SINGLE STEP for program debugging which is not included in others at the same price. With SINGLE STEP you can see the microprocessor chip operating with the unique Quest address and data bus displays before, during and after executing instructions. Also, CPU mode and instruction cycle are decoded and displayed on 8 LED indicators.

An RCA 1861 video graphics chip allows you to connect to your own TV with an inexpensive video modulator to do graphics and games. There is a speaker system included for writing your own music or using many music programs already written. The speaker amplifier may also be used to drive relays for control purposes.

Super Expansion Board with Cassette Interface \$89.95

This is truly an astounding value! This board has been designed to allow you to decide how you want it optioned. The Super Expansion Board comes with 4K of low power RAM fully addressable anywhere in 64K with built-in memory protect and a cassette interface. Provisions have been made for all other options on the same board and it fits neatly into the hardwood cabinet alongside the Super Elf. The board includes slots for up to 6K of EPROM (2708, 2758, 2716 or TI 2716) and is fully socketed. EPROM can be used for the monitor and Tiny Basic or other purposes.

A 1K Super ROM Monitor \$19.95 is available as an on board option in 2708 EPROM which has been preprogrammed with a program loader/editor and error checking multi file cassette read/write software, (relocatable cassette file) another exclusive from Quest. It includes register save and readout, block move capability and video graphics driver with blinking cursor. Break points can be used with the register save feature to isolate program bugs quickly, then follow with single step. The Super Monitor is written with

A 24 key HEX keyboard includes 16 HEX keys plus load, reset, run, wait, input, memory protect, monitor select and single step. Large, on board displays provide output and optional high and low address. There is a 44 pin standard connector slot for PC cards and a 50 pin connector slot for the Quest Super Expansion Board. Power supply and sockets for all IC's are included in the price plus a detailed 127 pg. instruction manual which now includes over 40 pgs. of software info. including a series of lessons to help get you started and a music program and graphics target game. Many schools and universities are using the Super Elf as a course of study. OEM's use it for training and R&D.

Remember, other computers only offer Super Elf features at additional cost or not at all. Compare before you buy. Super Elf Kit \$106.95. High address option \$8.95. Low address option \$9.95. Custom Cabinet with drilled and labelled plexiglass front panel \$24.95. Expansion Cabinet with room for 4 S-100 boards \$41.00. NiCad Battery Memory Saver Kit \$6.95. All kits and options also completely assembled and tested. Questdata, a 12 page monthly software publication for 1802 computer users is available by subscription for \$12.00 per year. Issues 1-12 bound \$16.50.

Tiny Basic Cassette \$10.00, on ROM \$38.00, original Elf kit board \$14.95. 1802 software; Mowies Video Graphics \$3.50. Games and Music \$3.00. Chip 8 Interpreter \$5.50.

subroutines allowing users to take advantage of monitor functions simply by calling them up. Improvements and revisions are easily done with the monitor. If you have the Super Expansion Board and Super Monitor the monitor is up and running at the push of a button.

Other on board options include Parallel Input and Output Ports with full handshake. They allow easy connection of an ASCII keyboard to the input port. RS 232 and 20 ma Current Loop for teletype or other device are on board and if you need memory there are two S-100 slots for static RAM or video boards. Also a 1K Super Monitor version 2 with video driver for full capability display with Tiny Basic and a video interface board. Parallel I/O Ports \$9.85, RS 232 \$4.50, TTY 20 ma I/F \$1.95, S-100 \$4.50. A 50 pin connector set with ribbon cable is available at \$15.25 for easy connection between the Super Elf and the Super Expansion Board.

Power Supply Kit for the complete system (see Multi-volt Power Supply below).

Same day shipment. First line parts only. Factory tested. Guaranteed money back. Quality IC's and other components at factory prices.

INTEGRATED CIRCUITS

7400TTL	19	LM323K-5	5.95	CD4028	2.50
7400N	19	LM323K-12	1.50	CD4027	88
7400N	20	LM323K-15	1.50	CD4028	85
7400N	25	LM323K-15	1.35	CD4029	1.35
7400N	23	LM323K-15	1.35	CD4030	1.35
7410N	20	LM323T-12	1.35	CD4031	1.35
7410N	20	LM323T-12	1.35	CD4033	1.35
7414N	70	LM320T-15	1.35	CD4040	1.35
7420N	19	LM339N	1.00	CD4043	85
7420N	38	LM339K-5	1.35	CD4044	85
7420N	38	LM339K-12	1.35	CD4046	1.87
7445N	58	LM340K-12	1.35	CD4048	45
7445N	58	LM340K-12	1.35	CD4049	45
7448N	77	LM340K-24	1.35	CD4051	1.13
7450N	20	LM340T-5	1.25	CD4060	1.42
7450N	35	LM340T-12	1.25	CD4066	71
7450N	49	LM340T-12	1.25	CD4068	40
7450N	88	LM340T-15	1.25	CD4069	40
7450N	185	LM340T-18	1.25	CD4070	50
7450N	43	LM340T-24	1.25	CD4071	40
7450N	43	LM340T-24	1.25	CD4072	40
7450N	43	LM340T-24	1.25	CD4073	40
7450N	43	LM340T-24	1.25	CD4074	40
7450N	43	LM340T-24	1.25	CD4075	40
7450N	43	LM340T-24	1.25	CD4076	40
7450N	43	LM340T-24	1.25	CD4077	40
7450N	43	LM340T-24	1.25	CD4078	40
7450N	43	LM340T-24	1.25	CD4079	40
7450N	43	LM340T-24	1.25	CD4080	40
7450N	43	LM340T-24	1.25	CD4081	40
7450N	43	LM340T-24	1.25	CD4082	40
7450N	43	LM340T-24	1.25	CD4083	40
7450N	43	LM340T-24	1.25	CD4084	40
7450N	43	LM340T-24	1.25	CD4085	40
7450N	43	LM340T-24	1.25	CD4086	40
7450N	43	LM340T-24	1.25	CD4087	40
7450N	43	LM340T-24	1.25	CD4088	40
7450N	43	LM340T-24	1.25	CD4089	40
7450N	43	LM340T-24	1.25	CD4090	40
7450N	43	LM340T-24	1.25	CD4091	40
7450N	43	LM340T-24	1.25	CD4092	40
7450N	43	LM340T-24	1.25	CD4093	40
7450N	43	LM340T-24	1.25	CD4094	40
7450N	43	LM340T-24	1.25	CD4095	40
7450N	43	LM340T-24	1.25	CD4096	40
7450N	43	LM340T-24	1.25	CD4097	40
7450N	43	LM340T-24	1.25	CD4098	40
7450N	43	LM340T-24	1.25	CD4099	40
7450N	43	LM340T-24	1.25	CD4100	40
7450N	43	LM340T-24	1.25	CD4101	40
7450N	43	LM340T-24	1.25	CD4102	40
7450N	43	LM340T-24	1.25	CD4103	40
7450N	43	LM340T-24	1.25	CD4104	40
7450N	43	LM340T-24	1.25	CD4105	40
7450N	43	LM340T-24	1.25	CD4106	40
7450N	43	LM340T-24	1.25	CD4107	40
7450N	43	LM340T-24	1.25	CD4108	40
7450N	43	LM340T-24	1.25	CD4109	40
7450N	43	LM340T-24	1.25	CD4110	40
7450N	43	LM340T-24	1.25	CD4111	40
7450N	43	LM340T-24	1.25	CD4112	40
7450N	43	LM340T-24	1.25	CD4113	40
7450N	43	LM340T-24	1.25	CD4114	40
7450N	43	LM340T-24	1.25	CD4115	40
7450N	43	LM340T-24	1.25	CD4116	40
7450N	43	LM340T-24	1.25	CD4117	40
7450N	43	LM340T-24	1.25	CD4118	40
7450N	43	LM340T-24	1.25	CD4119	40
7450N	43	LM340T-24	1.25	CD4120	40
7450N	43	LM340T-24	1.25	CD4121	40
7450N	43	LM340T-24	1.25	CD4122	40
7450N	43	LM340T-24	1.25	CD4123	40
7450N	43	LM340T-24	1.25	CD4124	40
7450N	43	LM340T-24	1.25	CD4125	40
7450N	43	LM340T-24	1.25	CD4126	40
7450N	43	LM340T-24	1.25	CD4127	40
7450N	43	LM340T-24	1.25	CD4128	40
7450N	43	LM340T-24	1.25	CD4129	40
7450N	43	LM340T-24	1.25	CD4130	40
7450N	43	LM340T-24	1.25	CD4131	40
7450N	43	LM340T-24	1.25	CD4132	40
7450N	43	LM340T-24	1.25	CD4133	40
7450N	43	LM340T-24	1.25	CD4134	40
7450N	43	LM340T-24	1.25	CD4135	40
7450N	43	LM340T-24	1.25	CD4136	40
7450N	43	LM340T-24	1.25	CD4137	40
7450N	43	LM340T-24	1.25	CD4138	40
7450N	43	LM340T-24	1.25	CD4139	40
7450N	43	LM340T-24	1.25	CD4140	40
7450N	43	LM340T-24	1.25	CD4141	40
7450N	43	LM340T-24	1.25	CD4142	40
7450N	43	LM340T-24	1.25	CD4143	40
7450N	43	LM340T-24	1.25	CD4144	40
7450N	43	LM340T-24	1.25	CD4145	40
7450N	43	LM340T-24	1.25	CD4146	40
7450N	43	LM340T-24	1.25	CD4147	40
7450N	43	LM340T-24	1.25	CD4148	40
7450N	43	LM340T-24	1.25	CD4149	40
7450N	43	LM340T-24	1.25	CD4150	40
7450N	43	LM340T-24	1.25	CD4151	40
7450N	43	LM340T-24	1.25	CD4152	40
7450N	43	LM340T-24	1.25	CD4153	40
7450N	43	LM340T-24	1.25	CD4154	40
7450N	43	LM340T-24	1.25	CD4155	40
7450N	43	LM340T-24	1.25	CD4156	40
7450N	43	LM340T-24	1.25	CD4157	40
7450N	43	LM340T-24	1.25	CD4158	40
7450N	43	LM340T-24	1.25	CD4159	40
7450N	43	LM340T-24	1.25	CD4160	40
7450N	43	LM340T-24	1.25	CD4161	40
7450N	43	LM340T-24	1.25	CD4162	40
7450N	43	LM340T-24	1.25	CD4163	40
7450N	43	LM340T-24	1.25	CD4164	40
7450N	43	LM340T-24	1.25	CD4165	40
7450N	43	LM340T-24	1.25	CD4166	40
7450N	43	LM340T-24	1.25	CD4167	40
7450N	43	LM340T-24	1.25	CD4168	40
7450N	43	LM340T-24	1.25	CD4169	40
7450N	43	LM340T-24	1.25	CD4170	40
7450N	43	LM340T-24	1.25	CD4171	40
7450N	43	LM340T-24	1.25	CD4172	40
7450N	43	LM340T-24	1.25	CD4173	40
7450N	43	LM340T-24	1.25	CD4174	40
7450N	43	LM340T-24	1.25	CD4175	40
7450N	43	LM340T-24	1.25	CD4176	40
7450N	43	LM340T-24	1.25	CD4177	40
7450N	43	LM340T-24	1.25	CD4178	40
7450N	43	LM340T-24	1.25	CD4179	40
7450N	43	LM340T-24	1.25	CD4180	40
7450N	43	LM340T-24	1.25	CD4181	40
7450N	43	LM340T-24	1.25	CD4182	40
7450N	43	LM340T-24	1.25	CD4183	40
7450N	43	LM340T-24	1.25	CD4184	40
7450N	43	LM340T-24	1.25	CD4185	40
7450N	43	LM340T-24	1.25	CD4186	40
7450N	43	LM340T-24	1.25	CD4187	40
7450N	43	LM340T-24	1.25	CD4188	40
7450N	43	LM340T-24	1.25	CD4189	40
7450N	43	LM340T-24	1.25	CD4190	40
7450N	43	LM340T-24	1.25	CD4191	40
7450N	43	LM340T-24	1.25	CD4192	40
7450N	43	LM340T-24	1.25	CD4193	40
7450N	43	LM340T-24	1.25	CD4194	40
7450N	43	LM340T-24	1.25	CD4195	40
7450N	43	LM340T-24	1.25	CD4196	40
7450N	43	LM340T-24	1.25	CD4197	40
7450N	43	LM340T-24	1.25	CD4198	40
7450N	43	LM340T-24	1.25	CD4199	40
7450N	43	LM340T-24	1.25	CD4200	40
7450N	43	LM340T-24	1.25	CD4201	40
7450N	43	LM340T-24	1.25	CD4202	40
7450N	43	LM340T-24	1.25	CD4203	40
7450N	43	LM340T-24	1.25	CD4204	40
7450N	43	LM340T-24	1.25	CD4205	40
7450N	43	LM340T-24	1.25	CD4206	40
7450N	43	LM340T-24	1.25	CD4207	40
7450N	43	LM340T-24	1.25	CD4208	40
7450N	43	LM340T-24	1.25	CD4209	40
7450N	43	LM340T-24	1.25	CD4210	40
7450N	43	LM340T-24	1.25	CD4211	40
7450N	43	LM340T-24	1.25	CD4212	40
7450N	43	LM340T-24	1.25	CD4213	40
7450N	43	LM340T-24	1.25	CD4214	40
7450N	43	LM340T-24	1.25	CD4215	40
7450N	43	LM340T-24	1.25	CD4216	40
7450N	43	LM340T-24	1.25	CD4217	40
7450N	43	LM340T-24	1.25	CD4218	40
7450N	43	LM340T-24	1.25	CD4219	40
7450N	43	LM340T-24	1.25	CD4220	40
7450N	43	LM340T-24	1.25	CD4221	40
7450N	43	LM340T-24	1.25	CD4222	40
7450N	43	LM340T-24	1.25	CD4223	40
7450N	43	LM340T-24	1.25	CD4224	40
7450N	43	LM340T-24	1.25	CD4225	40
7450N	43	LM340T-24	1.25	CD4226	40
7450N	43	LM340T-24	1.25	CD4227	40
7450N	43	LM340T-24	1.25	CD4228	40
7450N	43	LM340T-24	1.25	CD4229	40
7450N	43	LM340T-24	1.25	CD4230	40
7450N	43	LM340T-24	1.25	CD4231	40
7450N	43	LM340T-24	1.25	CD4232	40
7450N	43	LM340T-24	1.25	CD4233	40
7450N	43	LM340T-24	1.25	CD4234	40
7450N	43	LM340T-24	1.25	CD4235	40
7450N	43	LM340T-24	1.25	CD4236	40
7450N	43	LM340T-24	1.25	CD4237	40
7450N	43	LM340T-24	1.25	CD4238	40
7450N	43	LM340T-24	1.25	CD4239	40
7450N	43	LM340T-24	1.25	CD4240	40
7450N	43	LM340T-24	1.25	CD4241	40
7450N	43	LM340T-24	1.25	CD4242	40
7450N	43	LM340T-24	1.25	CD4243	40
7450N	43	LM340T-24	1.25	CD4244	40
7450N	43	LM340T-24	1.25	CD4245	40
7450N	43	LM340T-24	1.25	CD4246	40
7450N	43	LM340T-24	1.25	CD4247	40
7450N	43	LM340T-24	1.25	CD4248	40
7450N	43	LM340T-24	1.25	CD4249	40
7450N	43	LM340T-24	1.25	CD4250	40
7450N	43	LM340T-24	1.25	CD4251	40
7450N	43	LM340T-24	1.25	CD4252	40
7450N	43	LM340T-24	1.25	CD4253	40
7450N	43	LM340T-24	1.25	CD4254	40
7450N	43	LM340T-24	1.25	CD4255	40
7450N	43	LM340T-24	1.25	CD4256	40
7450N	43	LM340T-24	1.25	CD4257	40
7450					

DEALER DIRECTORY

Los Angeles, CA

Featuring: PolyMorphic, North Star, Imsai, Cromemco, Extensys, Speechlab products and Poly-88 Users Group software exchange. All products 10-20% off list. We won't be undersold! **A-A-A Discount Computer How's**, 1477 Barrington, Suite 17, Los Angeles, CA 90025, 477-8478.

San Jose, CA

Bay area's newest computer store. Featuring the new Texas Instruments TI 99/4 home & business computer. Software for TRS-80, Apple, PET, etc. Magazines. **Hobbi-Tronics**, 1378 S. Bascom Ave., San Jose, CA 95128, 998-1103.

Sarasota, FL

Dynabyte computer systems, Hazeltine and NEC, Word-Star, Structured Systems accounting. Consulting, training, sales, service. **Glisco, Inc.**, 4001 Roberts Point Rd., Sarasota, FL 33581, 349-0200.

Venice, FL

Discount prices & professional service: Cromemco, North Star, Vector Graphic, DEC, TI, Thinker Toys, Intertube, Soroc, Centronics, NEC, Selectric interfaces, Microdasy. Complete business & medical billing software available. MicroAge & Serendipity software discounted. **Sara-Tech Electronics, Inc.**, Computer Division, PO Box 692, Venice, FL 33595, 485-3559.

Say you saw
thier ad in
Microcomputing

Aurora, IL

Microcomputer systems for home or business; peripherals, software, books & magazines. Apple, Hewlett-Packard, North Star, Cromemco systems. IDS-440G printer w/Apple graphics. New HP-85 & HP calculators. **Farnsworth Computer Center**, 1891 N. Farnsworth Ave., Aurora, IL 60505, 851-3888.

Chicago, IL

Computer Hardware/Software Specialists for home and business. Largest selection of computer books, magazines and copyrighted software in Chicago Metro area. Experienced factory-trained service department. Feature Apple and Alpha Microsystems and accessories. **Data Domain of Schaumburg**, 1612 E. Algonquin Road., Schaumburg, IL 60195, 397-8700.

Naperville, IL

Computer systems design, programming and consultation by computer experts. Dealer for SSM, Integrand, Tarbell, Ithaca Intersystems, Verbatim, Diablo and others. Discount prices on many items. **Wilcox Enterprises**, 25W178-39th St., Naperville, IL 60540, 420-8601.

Laurel, MD

Apple & Exidy Sorcerer. Authorized dealer for both. We also sell subscriptions to "The Source" timeshare service. Plus full line of ham equipment. **The Comm Center, Laurel Plaza**, Rte. 198, Laurel, MD 20810, 792-0600.

Worcester, MA

Complete business and personal systems on Data General, microNova and Apple. Software, books, magazines, accessories and supplies. Custom business programming available. Authorized Apple service. Downtown. **The Computer Place Inc.**, 11 Harvard St., Worcester, MA 01609, 755-5387.

Garden City, MI

Complete systems for business, professional and personal applications. Custom programming available. Apple II, North Star, Vector Graphic and other lines of microcomputers, software, books, components. **Computer Center**, 28251 Ford Rd., Garden City, MI 48135, 422-2570.

St. Louis, MO

Experimenters' Paradise. Electronic and mechanical components. Computer People, Audio People, Hams, Robot Builders, Experimenters. Open six days a week. **Gateway Electronics Corp.**, 8123-25 Page Blvd., St. Louis, MO 63130, 427-6116.

Akron, OH

We've got it all. Business systems. Personal systems. Software packages. Custom programming. Terminals. Printers. Service and books. Easy freeway access. 10 AM to 6 PM Monday-Saturday. **The Basic Computer Shop**, Fairlawn Plaza, 2671 West Market St., Akron, OH 44313, 867-0808.

Portland, OR

Ohio Scientific specialists for business and personal computers. Local service. Terminals, printers, custom programming. Full OSI product line on display! 10AM to 6PM M-F. **Fial Computer**, 11266 SE 21st Ave., Milwaukie, OR 97222, 654-9574.

Kingston, PA

We support Level II and Model II. Books, magazines, programs, parts, accessories, peripherals, free literature, free seminars, cassettes, floppies, filters, transformers, caps, chips, CRTs. **Artco Electronics**, 302 Wyoming Ave., Kingston, PA 18704, 287-1014.

Sara, Mexico

Learn how to utilize and program the Z-80 microprocessor to maintain your company's records in top shape. This technique has just been introduced to Mexico. Courses, applications, maintenance, service. **Digitales, S.A. de C.V.** Sara 4612, Mexico 14, D.F., 5-17-41-59.

Dealers: Listings are \$15 per month in prepaid quarterly payments, or one yearly payment of \$150, also prepaid. Ads include 25 words describing your products and services plus your company name, address and phone. (No area codes or merchandise prices, please.) Call Marcia at 603-924-7138 or write **Kilobaud Microcomputing**, Ad Department, Peterborough, NH 03458.

TRS-80*

SAVE A BUNDLE

When you buy your
TRS-80™ equipment!

Use our toll free number to
check our price before you buy
a TRS-80™ . . . anywhere!

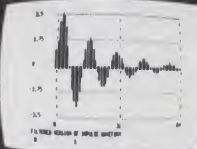
TRS-80 is a trademark of the Radio Shack Division of Tandy Corporation

full Radio Shack warranty



SALES COMPANY ✓ 189
1412 WEST FAIRFIELD DR.
P.O. BOX 8098 PENSACOLA FL 32505
904/438-6507
nationwide 1-800-874-1551

TRS 80




- **F(aster) F(ourier) T(ransform)**
- **Digital Filter Simulation**
- **Linear and Exponential Curve Fit**
- **Disk or Cassette Data & Results Files**
- **Interactive Graphics**

■ Having this set of interactive programs in your hands is a learning experience in digital signal processing.

■ Learn by doing. Documentation includes multiple examples. Balance your checkbook with a digital filter (can you believe it?). Plot daily stock market values and their computed trend lines. Find the frequency response of a digital filter. Illustrate Nyquist sampling theorem. Perform spectral analysis on any waveform (FFT).

■ This sophisticated software, written by a professor and consultant in the digital processing field for use in teaching and research, is written in basic for ease of user understanding and modification. Runs in a minimum 16K cassette system having expanded capabilities when used with disk and printer systems.

FFT-80 DISK	\$30.00
FFT-80 CASSETTE	\$25.00



P.O. Box 1181
Goleta, CA 93017



apple®

Apple II or Apple II Plus \$999
With 48k \$1199
 (plus shipping)

Entire System: with Apple II or Plus, 48k RAM, Disc II with controller \$1739
 (shipped free, continental U.S.)

SPECIAL! 3M or Memorex Diskettes, only \$35/box of 10

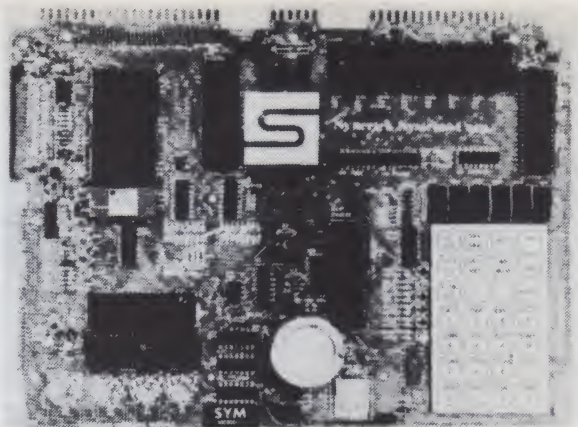
CALL TOLL FREE!
(800) 621-5802

ERICKSON Communications

5456 North Milwaukee Ave.
 Chicago, Illinois 60630
 (312) 631-5181 ✓ 254

SYM-1, 6502-BASED MICROCOMPUTER

- FULLY-ASSEMBLED AND COMPLETELY INTEGRATED SYSTEM that's ready-to-use
- ALL LSI IC'S ARE IN SOCKETS
- 28 DOUBLE-FUNCTION KEYPAD INCLUDING UP TO 24 "SPECIAL" FUNCTIONS
- EASY-TO-VIEW 6-DIGIT HEX LED DISPLAY
- KIM-1* HARDWARE COMPATIBILITY
- The powerful 6502 8-Bit MICROPROCESSOR whose advanced architectural features have made it one of the largest selling "micros" on the market today.
- THREE ON-BOARD PROGRAMMABLE INTERVAL TIMERS available to the user, expandable to five on-board.
- 4K BYTE ROM RESIDENT MONITOR and Operating Programs.
- Single 5 Volt power supply is all that is required.
- 1K BYTES OF 2114 STATIC RAM onboard with sockets provided for immediate expansion to 4K bytes onboard, with total memory expansion to 65, 536 bytes.
- USER PROM/ROM: The system is equipped with 3 PROM/ROM expansion sockets for 2316/2332 ROMs or 2716 EPROMs
- ENHANCED SOFTWARE with simplified user interface
- STANDARD INTERFACES INCLUDE:
 - Audio Cassette Recorder Interface with Remote Control (Two modes: 135 Baud KIM-1* compatible, Hi-Speed 1500 Baud)
 - Full duplex 20mA Teletype Interface
 - System Expansion Bus Interface
 - TV Controller Board Interface
 - CRT Compatible Interface (RS-232)
- APPLICATION PORT: 15 Bi-directional TTL Lines for user applications with expansion capability for added lines
- EXPANSION PORT FOR ADD-ON MODULES (51 I/O Lines included in the basic system)
- SEPARATE POWER SUPPLY connector for easy disconnect of the d-c power
- AUDIBLE RESPONSE KEYPAD



Synertek has enhanced KIM-1* software as well as the hardware. The software has simplified the user interface. The basic SYM-1 system is programmed in machine language. Monitor status is easily accessible, and the monitor gives the keypad user the same full functional capability of the TTY user. The SYM-1 has everything the KIM-1* has to offer, plus so much more that we cannot begin to tell you here. So, if you want to know more, the SYM-1 User Manual is available, separately

SYM-1 Complete w/manuals	\$229.00
SYM-1 User Manual Only	\$7.00
SYM-1 Expansion	\$60.00

Expansion includes 3K of 2114 RAM chips and 1-6522 I/O chip.

SYM-1 Manuals: The well organized documentation package is complete and easy-to-understand.

SYM-1 CAN GROW AS YOU GROW. It's the system to BUILD-ON.

Expansion features that are available:

BAS-1 8K Basic ROM (Microsoft Basic)	\$89.00
KTM-2 (Complete terminal less monitor)	\$319.00

QUALITY EXPANSION BOARDS DESIGNED SPECIFICALLY FOR KIM-1, SYM-1 & AIM 65

These boards are set up for use with a regulated power supply such as the one below, but, provisions have been made so that you can add onboard regulators for use with an unregulated power supply. But, because of unreliability, we do not recommend the use of onboard regulators. All I.C.'s are socketed for ease of maintenance. All boards carry full 90-day warranty.

All products that we manufacture are designed to meet or exceed industrial standards. All components are first quality and meet full manufacturer's specifications. All this and an extended burn-in is done to reduce the normal percentage of field failures by up to 75%. To you, this means the chance of inconvenience and lost time due to a failure is very rare; but, if it should happen, we guarantee a turn-around time of less than forty-eight hours for repair.

Our money back guarantee: If, for any reason you wish to return any board that you have purchased directly from us within ten (10) days after receipt, complete, in original condition, and in original shipping carton; we will give you a complete credit or refund less a \$10.00 restocking charge per board.

VAK-1 8-SLOT MOTHERBOARD

This motherboard uses the KIM-4* bus structure. It provides eight (8) expansion board sockets with rigid card cage. Separate jacks for audio cassette, TTY and power supply are provided. Fully buffered bus.

VAK-1 Motherboard	\$139.00
--------------------------	-----------------

VAK-2/4 16K STATIC RAM BOARD

This board using 2114 RAMs is configured in two (2) separately addressable 8K blocks with individual write-protect switches.

VAK-2 16K RAM Board with only 8K of RAM (1/2 populated)	\$239.00
VAK-3 Complete set of chips to expand above board to 16K	\$125.00
VAK-4 Fully populated 16K RAM	\$325.00

VAK-5 2708 EPROM PROGRAMMER

This board requires a +5 VDC and ± 12 VDC, but has a DC to DC

multiplier so there is no need for an additional power supply. All software is resident in on-board ROM, and has a zero-insertion socket.

VAK-5 2708 EPROM Programmer	\$249.00
------------------------------------	-----------------

VAK-6 EPROM BOARD

This board will hold 8K of 2708 or 2758, or 16K of 2716 or 2516 EPROMs. EPROMs not included.

VAK-6 EPROM Board	\$119.00
--------------------------	-----------------

VAK-7 COMPLETE FLOPPY-DISK SYSTEM

\$1299.00

See May Kilobaud for details

VAK-8 PROTOTYPING BOARD

This board allows you to create your own interfaces to plug into the motherboard. Etched circuitry is provided for regulators, address and data bus drivers; with a large area for either wire-wrapped or soldered IC circuitry.

VAK-8 Prototyping Board	\$39.00
--------------------------------	----------------

POWER SUPPLIES

ALL POWER SUPPLIES are totally enclosed with grounded enclosures for safety, AC power cord, and carry a full 2-year warranty.

FULL SYSTEM POWER SUPPLY

This power supply will handle a microcomputer and up to 65K of our VAK-4 RAM. ADDITIONAL FEATURES ARE: Over voltage Protection on 5 volts, fused, AC on/off switch. Equivalent to units selling for \$225.00 or more.

Provides +5 VDC @ 10 Amps & ± 12 VDC @ 1 Amp
VAK-EPS Power Supply **\$119.00**

VAK-EPS/AIM—same as VAK-EPS but w/additional 24 volt unregulated (specifically for AIM 65) **\$149.00**

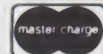
KIM-1* Custom P.S. provides 5 VDC @ 1.2 Amps and +12 VDC @ .1 Amps
KCP-1 Power Supply **\$39.00**

*KIM is a product of MOS Technology
Add \$2.50 for shipping & handling for all **except AIM 65.**

2967 W. Fairmount Avenue
Phoenix AZ 85017
(602)265-7564

RNB ENTERPRISES
INCORPORATED

52



IT'S KID JADE'S SURPLUS SALE.

S-100 Boards

THE BIG Z - Jade

2 or 4 MHz switchable Z-80 CPU with serial I/O	
CPU-30201K Kit	\$135.00
CPU-30201A A & T	\$199.00
CPU-30200B Bare board	\$35.00

SBC-100 - SD Systems

2.5 MHz Z-80 CPU with serial & parallel I/O ports	
CPC-30100K Kit	\$257.50
CPC-30100A A & T	\$325.00

SBC-200 - SD Systems

4 MHz Z-80 CPU with serial & parallel I/O ports	
CPC-30200K Kit	\$399.95
CPC-30200A A & T	\$475.00

CB2 - S.S.M.

2 or 4 MHz switchable Z-80 CPU with RAM, ROM, & I/O	
CPU-30300K Kit	\$185.00
CPC-30300A A & T	\$249.95

ExpandoRAM I - SD Systems

2.5 MHz RAM board expandable from 16K to 64K	
MEM-16130K 16K kit	\$199.95
MEM-16130A 16K A & T	\$249.95
MEM-32131K 32K kit	\$254.95
MEM-32131A 32K A & T	\$304.95
MEM-48132K 48K kit	\$309.95
MEM-48132A 48K A & T	\$359.95
MEM-64133K 64K kit	\$364.95
MEM-64133A 64K A & T	\$414.95

ExpandoRAM II - SD Systems

4 MHz RAM board expandable from 16K to 256K	
MEM-16630A 16K kit	\$249.95
MEM-16630A 16K A & T	\$299.95
MEM-32631K 32K kit	\$309.95
MEM-32631A 32K A & T	\$359.95
MEM-48632K 48K kit	\$369.95
MEM-48631A 48K A & T	\$409.95
MEM-64633K 64K kit	\$429.95
MEM-64633A 64K A & T	\$479.95

32K STATIC RAM - Jade

2 or 4 MHz expandable static RAM board uses 2114L's	
MEM-16150K 16K 2 MHz kit	\$249.95
MEM-16150A 16K 2 MHz A & T	\$299.95
MEM-16151K 16K 4 MHz kit	\$259.95
MEM-16151A 16K 4 MHz A & T	\$309.95
MEM-32150K 32K 2 MHz kit	\$399.95
MEM-32150A 32K 2 MHz A & T	\$449.95
MEM-32151K 32K 4 MHz kit	\$409.95
MEM-32151A 32K 4 MHz A & T	\$459.95

16K STATIC RAM - Cal Comp Sys

2 or 4 MHz 16K static RAM - a real memory bargain	
MEM-16160K 16K 2 MHz kit	\$249.95
MEM-16160A 16K 2 MHz A & T	\$279.00
MEM-16162K 16K 4 MHz kit	\$279.95
MEM-16162A 16K 4 MHz A & T	\$309.00
MEM-16160B Bare board	\$29.95

PB-1 - S.S.M.

2708, 2716 EPROM board with built-in programmer	
MEM-99510K Kit	\$119.95
MEM-99510A A & T	\$169.95

PROM-100 - SD Systems

2708, 2716, 2732, 2758, & 2516 EPROM programmer	
MEM-99520K Kit	\$175.00
MEM-99520A A & T	\$225.00

32K BYTESAVER - Cromemco

32K EPROM board with on-board 2716 programmer	
MEM-32550A A & T	\$295.00

Call for your free 1980 catalog

DOUBLE-D - Jade

Double density controller with the inside track	
IOD-1200K Kit	\$299.95
IOD-1200A 8" A & T	\$389.95
IOD-1205A 5 1/4" A & T	\$389.95
IOD-1200B Bare board	\$65.00

VERSAFLOPPY I - SD Systems

Versatile floppy disk controller for 8" or 5 1/4"	
IOD-1150K Kit	\$219.95
IOD-1150A A & T	\$269.95

VERSAFLOPPY II - SD Systems

New double density controller for both 8" & 5 1/4"	
IOD-1160K Kit	\$309.95
IOD-1160A A & T	\$369.95

I/O-4 - S.S.M.

2 serial I/O ports plus 2 parallel I/O ports	
IOI-1010K Kit	\$129.95
IOI-1010A A & T	\$189.95
IOI-1010B Bare board	\$29.95

BIT STREAMER II - Vector Graphic

3 serial I/O ports plus 2 parallel I/O ports	
IOI-1025A A & T	\$259.00

CB-1 - Mullen

S-100 controller for up to 8 external devices	
IOC-1100K Kit	\$119.95
IOC-1100A A & T	\$169.95

100K DAY CLOCK - Mtn Hardware

Crystal controlled S-100 clock with NiCad backup	
IOK-1400A A & T	\$329.95

SB1 - S.S.M.

15 Hz to 25K Hz music synthesizer for S-100	
IOS-1005K Kit	\$189.95
IOS-1005A A & T	\$269.95

TB-4 - Mullen

Extremely versatile extender board with logic probe	
TSX-180K Kit	\$55.00
TSX-180A A & T	\$75.00

TERMINATOR & EXTENDER - C.C.S.

Can be used as both an S-100 extender and terminator	
TSX-150K Kit	\$39.95

S-100 EXTENDER - Cal Comp Sys

Puts problem boards within easy reach	
TSX-160A A & T	\$24.95

VDB-8024 - SD Systems

80 x 24 I/O mapped video board with keyboard I/O	
IOV-1020K Kit	\$324.95
IOV-1020A A & T	\$379.95

VB3 - S.S.M.

80 x 24 or 80 x 51 memory mapped with graphics	
IOV-1090K Kit, 2 MHz	\$299.95
IOV-1090A A & T, 2 MHz	\$385.00
IOV-1095K Kit, 4 MHz	\$339.95
IOV-1095A A & T, 4 MHz	\$399.00
IOV-1091K 80 x 51 upgrade, 2 MHz	\$69.00
IOV-1096K 80 x 51 upgrade, 4 MHz	\$89.00

VIDEO BOARD - Jade

64 x 16 assembled & tested S-100 video board	
IOV-1050A A & T sale price	\$135.00

Modems

NOVATION CAT

300 baud, auto answer/originate acoustic modem	
IOM-5200A Special sale price	\$149.95

Call for your free 1980 catalog

Single Board Computer

AIM-65 - Rockwell

6502 computer with printer, display, & keyboard	
CPK-50165 1K AIM	\$374.95
CPK-50465 4K AIM	\$449.95
SFK-74600008E 8K BASIC ROM	\$99.95
SFK-64600004E 4K assembler ROM	\$84.95
PSX-030A Power supply	\$59.95
ENX-000002 Enclosure	\$49.95
4K AIM, 8K BASIC, power supply, & enclosure	
Special package price	\$599.00

32K RAM - for AIM-65

Dynamic memory board to expand your AIM-65	
MEM-99170A A & T w/out RAM ..	\$275.00
MEM-16170A A & T w/16K	\$325.00
MEM-32170A A & T w/32K	\$375.00
MEM-99170B Bare board	\$49.00

DISK CONTROLLER - for AIM-65

Add 5 1/4" or 8" disk drives to your AIM-65	
IOD-3013A A & T	\$575.00

VISIBLE MEMORY - for AIM-65

Video board with 8K memory & graphics for AIM-65	
IOV-3011A A & T	\$239.95

MEMORY-MATE - for AIM-65

The master-mater with 48K RAM, I/O, PROM, & music	
MEM-52301A A & T w/16K	\$475.00

Z-80 STARTER KIT - SD Systems

Z-80 computer with RAM, ROM, I/O, & keyboard	
CPS-30010K Kit	\$289.95
CPS-30010A A & T	\$349.95

Accessories for Apple

16K MEMORY UPGRADE

Add 16K of RAM to your TRS-80, Apple, or Exidy	
MEX-16100K TRS-80 kit	\$49.95
MEX-16101K Apple kit	\$49.95
MEX-16102K Exidy kit	\$49.95

DISK DRIVE for APPLE

5 1/4" disk drive with controller for your Apple	
MSM-12310C with controller	\$495.00
MSM-123101 w/out controller	\$425.00

8" DRIVES for APPLE

Controller, DOS, two 8" drives, cabinet, & cable	
Special package price	\$1475.00

AIO - S.S.M.

Parallel & serial interface for your Apple	
IOI-2050K Kit	\$115.00
IOI-2050A A & T	\$155.00

SUP'RTERMINAL - M & R Assoc

80 x 24 video display board for your Apple	
IOV-2100A A & T	\$359.00

SUPERTALKER - Mtn Hardware

Speech recognition/synthesizer w/speaker & mike	
IOS-2015A A & T	\$275.00

Z-80 CARD for APPLE

Z-80 CPU card with CP/M for your Apple	
CPX-30800A A & T	\$345.00

MICROMODEM - D.C. Hayes

Auto answer/dial modem card for Apple or S-100	
IOM-2010A Apple modem	\$349.95
IOM-1100A S-100 modem	\$375.00

SUP'RMOD II - M & R Assoc

Color or B & W TV interface recommended for Apple	
IOR-5050A A & T	\$29.95

SUMMER '80 ROUND #4.

**KNOCKOUT
PRICES**

Printers

BASE 2 - Impact Printer

132 cps, bi-directional, tractor feed, & graphics
PRM-13100 \$625.00

DP-9500 - Anadex

9 x 9 dot matrix, 176 column, 200 cps, & graphics
PRM-10500 Standard DP-9500 \$1395.00
PRM-10510 with graphics & 2K .. \$1495.00

LP-80 - Matchless

9 x 7 matrix, 132 column, 125 cps, bi-directional
PRM-37204 \$775.00

PAPER TIGER - Integral Data

132 column, parallel & serial, 150 cps, graphics
PRM-33440 IDS-440 \$950.00
PRM-33441 IDS-440 w/graphics .. \$1050.00

MILOT - Watanabe Instruments

Intelligent graphics plotter uses 7 bit ASCII code
PRP-10800 \$1075.00

SPINWRITER - NEC

65 cps, bi-directional, letter quality with tractor
PRD-55510 with 2K buffer \$2995.00

Motherboards

ISO-BUS - Jade

Silent, simple, and on sale - a better motherboard

6 Slot (5 1/4" x 8 1/2")
MBS-061B Bare board \$19.95
MBS-061K Kit \$39.95
MBS-061A A & T \$49.95
12 Slot (9 1/4" x 8 1/2")
MBS-121B Bare board \$29.95
MBS-121K Kit \$69.95
MBS-121A A & T \$89.95
18 Slot (14 1/2" x 8 1/2")
MBS-181B Bare board \$49.95
MBS-181K Kit \$99.95
MBS-181A A & T \$139.95

Mainframes

MAINFRAME - Cal Comp Sys

12 slot S-100 mainframe with 20 amp power supply
ENC-112105 Kit \$309.95
ENC-112106 A & T \$349.95

DISK MAINFRAME - NNC

Dual 8" drive cutouts with 8 slot motherboard
ENS-112320 with 30 amp p.s. \$699.95

Video Monitors

VIDEO 100 - Leedex

12" B & W video monitor with 12 MHz bandwidth
VDM-801210 \$139.95

VIDEO 100-80 - Leedex

81 x 24 version of Video 100 with metal cabinet
VDM-801230 \$189.95

B & W MONITOR - Sanyo

High quality, high resolution video monitors
VDM-700901 9" monitor \$209.95
VDM-701501 15" monitor \$279.95

13" COLOR MONITOR - Zenith

The hi res color you've been promising yourself
VDC-201301 \$449.00

Call for your free 1980 catalog

Disk Drives

JADE DISK PACKAGE

Double-D controller kit, two 8" double density
disk drives, cabinet, power supply, & cables
Special package price \$1295.00

DUAL 8" DRIVES - Lobo

A pair of double density Shugarts in a cabinet
MSF-12800R 2 single sided \$995.00
MSF-12520R 2 double sided \$1425.00

HARD DISK - Lobo

10 Megabyte capacity for TRS-80 or Apple systems
MSH-12771C Apple hard disk \$4395.00
MSH-12772C TRS-80 hard disk ... \$4395.00

DISKETTES - Jade

Bargain prices on magnificent magnetic media

5 1/4" single sided, single density, box of 10
MMD-5110103 Soft sector \$27.95
MMD-5111003 10 sector \$27.95
MMD-5111603 16 sector \$27.95
5 1/4" double sided, double density, box of 10
MMD-5220103 Soft sector \$39.95
8" single sided, single density, box of 10
MMD-8110103 Soft sector \$33.95
8" single sided, double density, box of 10
MMD-8120103 Soft sector \$55.95
8" double sided, double density, box of 10
MMD-8220103 Soft sector \$57.95

FLOPPY SAVERS - Tri-Star

Protect your valuable software from spindle damage
MMA-205 5 1/4" kit \$13.95
MMA-208 8" kit \$15.95

Software

CP/M 2.2 - Digital Research

Latest & most powerful release of CP/M
SFC-52506000D Manual set \$24.95
SFC-52506000M 5 1/4" disk & manual \$149.95
SFC-52506000F 8" disk & manual \$149.95

MP/M - Digital Research

Multi-user operating system for Z-80 computers
SFC-52507000F 8" disk & manual \$295.00

PASCAL/MT - MetaTech

A powerful language for CP/M systems
SFC-73301001F 8" disk & manual .. \$99.95

SDOS - SD Systems

DOS, CBASIC-2, Z-80 assembler/editor/linker
SFX-55001000D Manual set \$24.95
SFX-55001002M 5 1/4" disks & man \$149.95
SFX-55001006F 8" disk & manual \$149.95

WORDSTAR - MicroPro Intl

The finest word-processing package for CP/M
SFC-13600100F 8" disk & manual \$395.00

VISICALC - Personal Software

Visible business/accounting calculator for Apple
SFA-24101005M 5 1/4" disk & manual \$145.00

SINGLE DRIVE COPY - for Apple

Make back-up disks with just a single Disk II
SFA-51150010M 5 1/4" disk & manual \$19.95

SUPER-TEXT - Muse

Professional word-processing package for Apple
SFA-13800085M 5 1/4" disk & manual \$99.95

EPROM ERASER - L.S.Engineering

UV eraser for up to 48 EPROMs
XME-3200 A & T \$39.95

MICROPROCESSORS

Z-80 \$10.95
Z-80A \$14.95
6802 \$11.50
6800 \$11.95
6809 \$17.95
8035 \$24.00
8035-8 \$24.00
8080A \$ 6.59
8085 \$15.95
TMS9900J1 \$39.95

PROMS

2708 (450ns) \$ 8.95
2716 (450ns) \$34.95
2716 (5v) \$34.95
2732 (5v) \$95.00
2758 (5v) \$34.95

RAMS

211.02 (2 MHz) \$ 1.25
211.02 (4 MHz) \$ 1.50
2114L (2 MHz) \$ 5.75
2114L (4 MHz) \$ 5.95
4116 \$ 8.95
4127 (70ns) \$ 39.95
4164 (64K x 1) \$175.00
5257 (2 MHz) \$ 6.75
5257 (4 MHz) \$ 7.25

SUPPORT DEVICES

8212 \$ 4.95
8214 \$ 4.65
8216 \$ 2.95
8224 \$ 3.25
8224-4 \$10.95
8226 \$ 3.85
8228 \$ 4.95
8238 \$ 4.95
8243 \$ 8.00
8250 \$14.95
8251 \$ 6.50
8253 \$13.95
8255 \$ 6.50
8257 \$19.95
8259 \$17.95
8275 \$49.95
8279 \$15.95

UARTS

AYS-1013A \$5.25
AY3-1014A \$8.25
TR1602B \$5.25
TMS6011 \$5.95
IM6403 \$9.00

BAUD RATE GENERATORS

MC14411 \$10.00
CRYSTAL \$ 4.95

8000

Z80 SUPPORT SUPPORT
3881 (PIO) \$ 9.50 6821P \$ 5.95
3881-4 \$11.95 6828P \$11.95
(PIO-4 MHz) \$14.50 6834P \$12.95
3882 (CTC) \$ 9.50 6840P \$18.75
3882-4 \$ 4.80 6850P \$ 4.80
(CTC-4MHz) \$14.95 6852P \$ 5.79
3883 (SIO) \$29.50 6875L \$ 7.40
3884 (SIO) \$49.50 68488P \$25.00

PLACE ORDERS TOLL FREE

Inside California Continental U.S.
800-262-1710 800-421-5500

For customer service
or technical inquiries call 213-973-7707

Write for our FREE 1980 catalog

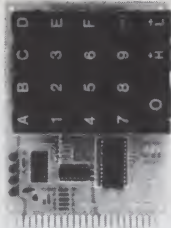
JADE
COMPUTER PRODUCTS
4901 W. Rosecrans, Hawthorne, CA 90250

TERMS OF SALE: Cash, checks, credit cards
money orders or from recognized institutions
Purchase orders accepted. Minimum order \$10.00.
California residents add 6% sales tax. Minimum
shipping and handling charge \$2.50. Prices are for
U.S. and Canadian delivery only and are subject
to change without notice. For export prices and
information send for a JADE INTERNATIONAL
CATALOG.

✓ 48 VISA MASTERCARD

HEX ENCODED KEYBOARD

Four onboard LEDs indicate the HEX code generated for each key depression. The board requires a single +5 volt supply. Board only \$15.00 Part No. HEX-3, with parts \$49.95 Part No. HEX-3A. 44 pin edge connector \$4.00 Part No. 44P.



T.V. TYPEWRITER



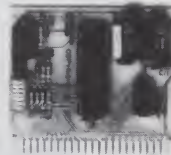
- Stand alone TVT
- 32 char/line, 16 lines, modifications for 64 char/line included
- Parallel ASCII (TTL) input
- Video output
- 1K on board memory
- Output for computer controlled cursor
- Auto scroll
- Non-destructive cursor
- Cursor inputs: up, down, left, right, home, EOL, EOS
- Scroll up, down
- Requires +5 volts at 1.5 amps, and -12 volts at 30 mA
- All 7400, TTL chips
- Char. gen. 2513
- Upper case only
- Board only \$39.00 Part No. 106, with parts \$145.00 Part No. 106A

44 BUS MOTHER BOARD



Has provisions for ten 44 pin (.156) connectors, spaced 3/4 of an inch apart. Pin 20 is connected to X, and 22 is connected to Z for power and ground. All the other pins are connected in parallel. This board also has provisions for bypass capacitors. Board cost \$15.00 Part No. 102. Connectors \$3.00 each Part No. 44WP.

UART & BAUD RATE GENERATOR



- Converts serial to parallel and parallel to serial
- Low cost on board baud rate generator
- Baud rates: 110, 150, 300, 600, 1200, and 2400
- Low power drain +5 volts and -12 volts required
- TTL compatible
- All characters contain a start bit, 5 to 8 data bits, 1 or 2 stop bits, and either odd or even parity.
- All connections go to a 44 pin gold plated edge connector
- Board only \$12.00 Part No. 101, with parts \$35.00 Part No. 101A, 44 pin edge connector \$4.00 Part No. 44P

RS-232/20mA INTERFACE



This board has two passive, opto-isolated circuits. One converts RS-232 to 20mA, the other converts 20mA to RS-232. All connections go to a 10 pin edge connector. Requires +12 and -12 volts. Board only \$9.95, part no. 7901, with parts \$14.95 Part No. 7901A.

ASCII TO CORRESPONDENCE CODE CONVERTER

This bidirectional board is a direct replacement for the board inside the Trendata 1000 terminal. The on board connector provides RS-232 serial in and out. Sold only as an assembled and tested unit for \$249.95. Part No. TA 1000C

ASCII KEYBOARD

53 Keys popular ASR-33 format • Rugged G-10 P.C. Board • Tri-mode MOS encoding • Two-Key Rollover • MOS/DTL/TTL Compatible • Upper Case lockout • Data and Strobe inversion option • Three User Definable Keys • Low contact bounce • Selectable Parity • Custom Keycaps • George Risk Model 753. Requires +5, -12 volts. \$59.95 Kit.

ASCII KEYBOARD

TTL & DTL compatible • Full 67 key array • Full 128 character ASCII output • Positive logic with outputs resting low • Data Strobe • Five user-definable spare keys • Standard 22 pin dual card edge connector • Requires +5VDC, 325 mA. Assembled & Tested. Cherry Pro Part No. P70-05AB. \$119.95.



COMPRINT PRINTER



Printing Characteristics: 225 characters/second (170 lines/minute) throughput • 9 horizontal x 12 vertical matrix • 96 ASCII character set with upper and true lower case • 80 characters/line • 5.8 lines/inch

Buffer Memory: standard 256 bytes; optional; 2,048 bytes (buffer memory option designated as Model 912-2K), add \$149.95.

Paper Requirements: electrosensitive type (aluminum coated) • 8-1/2 inch width • 3.7 inch max. (300 ft.) roll diameter.

Model 912-S Interfacing: serial interface RS232 and 20 mA current loop • BAUD rates 110, 150, 300, 600, 1200, 2400 and 4800 are strap selectable.

Model 912-P Interfacing: parallel interface, IEEE-488 and 8 bit parallel (strobe/acknowledge). Model 912-S, Part No. CPIA, 32118, \$579.95. Model 912-P, Part No. CPIA, 32117, \$559.95.

T.V. INTERFACE



- Converts video to AM modulated RF. Channels 2 or 3. So powerful almost no tuning is required. On board regulated power supply makes this extremely stable. Rated very highly in Doctor Dobbs' Journal. Recommended by Apple
- Power required is 12 volts AC C.T., or +5 volts DC
- Board only \$7.60 part No. 107, with parts \$13.50 Part No. 107A

SOROC IQ 120



Upper/lower case display • Numeric keypad & cursor keys • Protected fields, 1/2 intensity display • RS 232 interface & aux. port. IQ120—\$799.95 • IQ140 Detachable keyboard—\$1199.95

RS-32/TTL INTERFACE



- Converts TTL to RS-232, and converts RS-232 to TTL
- Two separate circuits
- Requires -12 and +12 volts
- All connections go to a 10 pin edge connector; kit \$9.95 Part No. 232A10P, edge connector \$3.00 part No. 10P.

DC POWER SUPPLY

- Board supplies a regulated +5 volts at 3 amps., +12, -12, and -5 volts at 1 amp.
- Power required is 8 volts AC at 3 amps., and 24 volts AC C.T. at 1.5 amps.
- Board only \$12.50 Part No. 6085, with parts excluding transformers \$42.50 Part No. 6085A



TAPE INTERFACE



- Converts a low cost tape recorder to a digital recorder
- Works up to 1200 baud
- Digital in and out are TTL serial
- Output of board connects to mic. in of recorder
- Earphone of recorder connects to input on board
- No coils
- Requires +5 volts, low power drain
- Board only \$7.60 Part No. 111, with parts \$29.95 Part No. 111A

MODEM



- Type 103
- Full or half duplex
- Works up to 300 baud
- Originate or Answer
- Serial TTL input and output
- connect 8 Ω speaker and crystal mic. directly to board
- Requires +5 volts
- Board only \$7.60 Part No. 109, with parts \$29.95 Part No. 109A.

COMPUCOLOR II



With reg. keyboard MOD3 8K \$1595.95 MOD4 16K \$1695.95 MOD5 32K \$1995.95 Now includes \$250 more, worth of software and accessories with 101 key option add \$134.95 with 117 key option add \$179.95

To Order: Mention part no. description, and price. In USA shipping paid by us for orders accompanied by check or money order. We accept C.O.D. orders in the U.S. only, or a VISA or Master Charge no., expiration date, signature, phone no., shipping charges will be added. CA residents add 6.5% for tax. Outside USA add 10% for air mail postage and handling. Payment must be in U.S. dollars. Dealer inquiries invited. 24 hour order line (408) 448-0800



Send for FREE Catalog . . . a big self-addressed envelope with 41¢ postage gets it fastest!

ELECTRONIC SYSTEMS Dept. KB P. O. Box 21638, San Jose, CA USA 95151

apple II Or APPLE II PLUS



16K \$975.95, Extra 16K E.S. RAM installed \$74.95, extra 32K E.S. RAM installed \$148.95.

APPLE II HOBBY/ PROTOTYPING CARD

Part No. 7907 \$14.95

REAL TIME 100,000 DAY CLOCK

MT. HARDWARE Double the utility of your S-100 bus computer with a real-time clock that keeps time in 100µS increments for over 273 years. Program events for the entire period with real time interrupts...without derailing the system. Maintain a log of computer usage, time and date transaction printouts, call up lists...virtually any activity where time is a factor. On-board battery backup. MHPX004—\$249.95

SUPER MODEM



Originate, RS-232 and 20 mA compatible, Full duplex, and half duplex, direct connect or acoustic coupled, on board power supply, carrier detect light, DB25 plug, 300 BAUD, Type 103 compatible frequencies, Bare board Part No. 2000, \$19.95, Kit Part No. 2000A, \$99.95.

16K EPROM



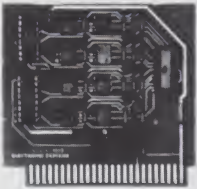
Uses 2708 EPROMS, memory speed selection provided, addressable anywhere in 65K of memory, can be shadowed in 4K increments. Board only \$24.95 part no. 7902, with parts less EPROMs \$49.95 part no. 7902A.

PET COMPUTER



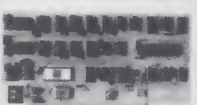
With 16K & monitor - \$795. Dual Disk Drive - \$10.95

OPTO-ISOLATED PARALLEL INPUT BOARD FOR APPLE II



There are 8 inputs that can be driven from TTL logic or any 5 volt source. The circuit board can be plugged into any of the 8 sockets of your Apple II. It has a 16 pin socket for standard dip ribbon cable connection. Board only \$15.00. Part No. 120, with parts \$69.95. Part No. 120A.

VIDEO TERMINAL



16 lines, 64 columns • Upper and lower case • 5x7 dot matrix • Serial RS-232 in and out with TTL parallel keyboard input • On board baud rate generator 75, 110, 150, 300, 600, & 1200 jumper selectable • Memory 1024 characters (7-21102) • Video processor chip SFF96364 by Neculonic • Control characters (CR, LF, →, ←, ↑, ↓, non destructive cursor, CS, home, CL • White characters on black background or vice-versa • With the addition of a keyboard, video monitor or TV set with TV interface (part no. 107A) and power supply this is a complete stand alone terminal • also S-100 compatible • requires +16, & -16 VDC at 100mA, and 8VDC at 1A. Part No. 1000A \$199.95 kit.

PARALLEL TRIAC OUTPUT BOARD FOR APPLE II



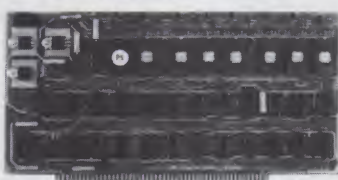
This board has 8 triacs capable of switching 110 volt 6 amp loads (660 watts per channel) or a total of 5280 watts. Board only \$15.00 Part No. 210, with parts \$119.95 Part No. 210A.

APPLE II** SERIAL I/O INTERFACE



Baud rate is continuously adjustable from 0 to 30,000 • Plugs into any peripheral connector • Low current drain. RS-232 input and output • On board switch selectable 5 to 8 data bits, 1 or 2 stop bits, and parity or no parity either odd or even • Jumper selectable address • SOFTWARE • Input and Output routine from monitor or BASIC to teletype or other serial printer • Program for using an Apple II for a video or an intelligent terminal. Also can output in correspondence code to interface with some electrics. • Also watches DTR • Board only \$15.00 Part No. 2, with parts \$42.00 Part No. 2A, assembled \$62.00 Part No. 2C

8K EPROM PIGEON



• Programs 2708's address relocation of each 4K of memory to any 4K boundary • Power on jump and reset jump option for "turnkey" systems and computers without a front panel • Program saver software in 1 2708 EPROM \$25. Bare board \$35 including custom coil, board with parts but no EPROMs \$139, with 4 EPROMs \$179, with 8 EPROMs \$219.

WAMECO PRODUCTS

With ELECTRONIC SYSTEMS parts

FDC-1 FLOPPY CONTROLLER BOARD will drive shugart, pertek, remex 5" & 8" drives up to 8 drives, on board PROM with power boot up, will operate with CPM (not included). PCBD \$42.95
FPB-1 Front Panel. (Finally) IMSAI size hex displays. Byte or instruction single step. PCBD \$42.95
MEM-1A 8Kx8 fully buffered, S-100, uses 2102 type RAMS. PCBD \$24.95, \$168 Kit
QMB-12 MOTHER BOARD, 13 slot, terminated, S-100 board only \$34.95, \$89.95 Kit
CPU-1 8080A Processor board S-100 with 8 level vector interrupt PCBD \$25.95, \$89.95 Kit
RTC-1 Realtime clock board. Two independent interrupts. Software programmable. PCBD \$25.95, \$60.95 Kit
EPM-1 1702A 4K EPROM card PCBD \$25.95, \$49.95 with parts less EPROMS
EPM-2 2708/2716 16K/32K EPROM card PCBD \$24.95, \$49.95 with parts less EPROMS
QMB-9 MOTHER BOARD, Short Version of QMB-12. 9 Slots PCBD \$30.95, \$67.95 Kit
MEM-2 16Kx8 Fully Buffered 2114 Board PCBD \$25.95, \$269.95 Kit

D.C. HAYES MICROMODEM



Fully S-100 bus compatible including 16-bit machines and 4 MHz processors. • Two software selectable Baud rates—300 Baud and a jumper selectable speed from 45 to 300 Baud. (110 standard). Supports originate and answer modes. • Direct-connect Microcoupler. This FCC-registered device provides direct access into your local telephone system, with none of the losses or distortions associated with acoustic couplers and without a telephone company supplied data access arrangement. • Auto-Answer/Auto-Call. The MICROMODEM 100 can automatically answer the phone and receive input; it can also dial a number automatically. • Automatic Reset and Disconnect. • Software compatible with the D.C. Hayes Associates 80-103A Data Communications Adapter. Micromodem-DCHA32625—\$379.95

TIDMA

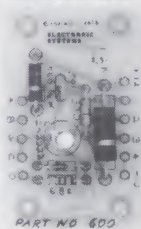


Tape Interface Direct Memory Access • Record and play programs without bootstrap loader (no prom) has FSK encoder/decoder for direct connections to low cost recorder at 1200 baud rate, and direct connections for inputs and outputs to a digital recorder at any baud rate • S-100 bus compatible • Board only \$35.00 Part No. 112, with parts \$110.00 Part No. 112A.

SYSTEM MONITOR

8080, 8085, or Z-80 System monitor for use with the TIDMA board. There is no need for the front panel. Complete with documentation \$12.95.

RS-232/TTY INTERFACE



This board has two active circuits, one converts RS-232 to 20 mA, the other converts 20 mA to RS-232. Requires +12 and -12 volts. \$9.95 Part No. 600A Kit.

SERIAL I/O



Four Serial I/O RS-232 ports. S-100 Bus, Software or jumper selectable baud rate (110, 300, 600, 1200, 2400, 4800, 9600, 19.2K), on board Xtal baud rate generator, Addressing, switch selectable, Parity or no parity (odd or even) switch selectable, 1 or 2 stop bits, 5 to 8 bits/character. Board only \$29.95, Part No. 7908. With parts (kit) \$199.95, Part No. 7908A.

S-100 BUS ACTIVE TERMINATOR



Board only \$14.95 Part No. 900, with parts \$24.95 Part No. 900A

To Order: Mention part no. description, and price. In USA shipping paid by us for orders accompanied by check or money order. We accept C.O.D. orders in the U.S. only, or a VISA or Master Charge no., expiration date, signature, phone no., shipping charges will be added. CA residents add 6.5% for tax. Outside USA add 10% for air mail postage and handling. Payment must be in U.S. dollars. Dealer inquiries invited. 24 hour order line (408) 448-0800



Send for FREE Catalog... a big self-addressed envelope with 41¢ postage gets it fastest!

ELECTRONIC SYSTEMS Dept. KB P. O. Box 21638, San Jose, CA USA 95151

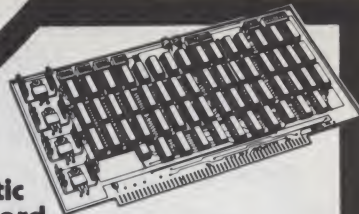
✓ 47

HOBBYWORLD[®] ELECTRONICS, INC.

Call Toll-Free: USA (800) 423-5387

In California: (800) 382-3651

Local & Outside USA: (213) 886-9200



CCS 16K Static Ram Board

True static RAM board designed specifically for the S-100 bus. Requires only +5VDC. Features true static operation, and all bus signals labeled on-board! Uses 2114 low power static RAMs. S-100 compatible, fully buffered. Silk screened PC board, solder masked on both sides.

Cat No.	Description	Wt	Price
1601A	16K RAM 450ns Kit	1 lb	\$253.50
1601B	16K RAM 200ns Kit	1 lb	\$333.50
1601C	16K RAM 300ns Kit	1 lb	\$293.50
1602A	16K RAM 450ns A & T	1 lb	\$285.75
1602B	16K RAM 200ns A & T	1 lb	\$371.50
1602C	16K RAM 300ns A & T	1 lb	\$328.50
1603	16K RAM Bareboard only	6 oz.	\$ 29.95

CCS 32K Static RAM Board \$710

Uses 2114, 250ns fully Static RAMs, bank selectable in 8K blocks. Enable/Disable on Power up or Reset. Compatible with North Star, Alpha Micro, Cromeco, etc. Also front panel compatible, addressable in 8K blocks. Selectable Wait state. Wt 1 lb. Assembled & tested. Cat No. 2644

Microsoft TRS-80 FORTRAN +

Fortran is now available for TRS-80! Because Fortran Plus is a compiler and will support any I/O, most level II BASIC limitations are eliminated. Create your own subroutines, assembler source files, data files and FORTRAN files. Fully compatible with TRS DOS, the FORTRAN compiler can operate 1200 lines per minute on a single pass. Requires a minimum 32K TRS-80 disk system. Compiler also generates a fully symbolic listing of the machine language that is generated. Also included is a Macro assembler that accepts Z80 opcodes and supports complete Intel standard macro facility. Linking loader provides a variety of capabilities, which are executed by means of easy command lines and switches. Any number of programs may be loaded with just one command.

A comprehensive library of subroutines is supplied. Most of the popular commands as well as a few special ones are included. Only the library routines required to run a particular FORTRAN program need be loaded before execution. Users may write non-standard I/O drivers for each Logic Unit Number, making the task of interfacing non-standard devices to TRS-80 FORTRAN programs straightforward.

Cat No. 1341

\$185.

16K MEMORY ADD-ON KIT \$55.00

Everything you need to upgrade your TRS-80, Apple or Exidy! An additional 16K Includes Illustrated Instructions, RAMS and preprogrammed jumpers. No special tools required. Wt. 4 oz.

CAT NO	DESCRIPTION
1156	TRS-80 Keyboard Unit
1156-A	TRS-80 Exp. Interface (prior to 4/1/79)
1156-B	TRS-80 Exp. Interface (after 4/1/79)
1156-C	for Apple II
1156-D	for Exidy

56 Key ASCII Keyboard

Professional quality at an affordable price. Interfaces with all computers requiring 7-bit standard ASCII code. Packed with features such as tri-mode MOS encoding, positive or negative logic output, pulsed and level strobe, and two key rollover! Compatible with CMOS, TTL, and DTL circuitry. On-board electronic shift-lock. Easy to assemble, with full documentation.

Cat No.	Description	Wt.	Price
1143	Keyboard kit	2 lb	\$63.00
1144	Keyboard a & t	2 lb	\$74.50
1548	All metal, pre-cut enclosure	3 lb	\$30.75
1144A	Edge connector for keyboard	8 oz	\$ 3.50

Leedex VIDEO 100 12" MONITOR

- Compatible with TRS-80 (no interface required)
- Compatible with many home computers!

Now from LEEDEX... One of the most popular low cost, yet high resolution (650 line) monitors currently available. These units compare favorably with monitors costing twice as much. Because of the fact that standard composite video input is utilized no RF modulator is needed. An extremely sharp and stable picture is achieved. The video bandwidth is 12 mhz + / - 3db with a 75 ohm input impedance.

Cat No.	Description	Wt.	Price
1204	Video 100 Monitor	18 lb.	\$149.00
1937	TRS-80/Leedex cable kit	Wt. 6 oz.	\$ 3.00

SSM SB 1 MUSIC SYNTHESIZER BOARD

Wave form synthesizer, designed to interface with the S-100 bus. Can be programmed to play a monophonic solo in an instrumental voice that is controlled by the software. Software includes a timer for definition of tempo and time signatures. Music can be heard immediately after the notation has been typed in. Multiple cards can be used to produce chords and harmonies. Weight 1 lb.

Cat No.	Description	Price
1408	Kit with Software	\$199
1409	SB 1 Assembled & Tested	\$279
1410	SB 1 bare board	\$ 45

MICROPOLIS[®] DISK DRIVES

Imagine a 5 1/4" floppy disk system with all the storage capacity of an 8" floppy system, and more!

Micropolis can give you more storage because they pack more data onto every disk. Ordinary 5 1/4" floppies provide just 35 tracks per drive and store 70 to 130 K bytes of data. Instead, Micropolis uses 77 tracks each with 16 sectors of 156 bytes to yield an incredible storage capacity of 315k bytes per drive.

And that's not all! Reliability doesn't just happen by accident. At Micropolis reliability is engineered into each step of manufacturing. For example, most 5 1/4" floppy disks cut costs by using a plastic cam or cam follower to position the read/write head. Micropolis chose to use the strength and durability of an all steel cam and cam follower. Sure, it costs more, but it gives you more accurate tracking over a significantly greater lifespan which adds up to a lower cost per byte with use. Software from Micropolis includes a comprehensive DOS, (disk operating system), and disk Extended Basic designed for 8080/280 microcomputer systems. The DOS is complete with an assembler, editor, file management functions and disk utilities. Micropolis BASIC is a complete, powerful programming tool for developing, testing, executing and maintaining basic programs.

The model 1043 MOD II is a single floppy disk with 315k bytes storage and includes the S-100 disk Controller board. If you need more storage, or simply want to save even more money, then order the model 1053 MOD II dual disk system with 630k bytes storage capacity and S-100 Controller board. Micropolis DOS and disk extended BASIC are standard with both units.

Cat No.	Description	Weight	Price
2563	Model 1043 mod II single drive	9 lbs	\$1145.00
2564	Model 1053 mod II dual drive	18 lbs	\$1895.00

VERBATIM 5 1/4" DISKETTES 10 per box

CAT NO.	TYPE	DESCRIPTION	PRICE
1147	525-01	Soft sector, TRS-80, etc.	\$33.00
1148	525-10	10 hole, hard, Apple, North Star	\$33.00
1149	525-16	16 hole, hard, Micropolis	\$33.00
2330	577-01	Soft sector, certified	\$48.95
2331	577-10	10 hole, hard, certified	\$48.95
2332	577-16	16 hole, hard, certified	\$48.95

DISKETTE DRIVE HEAD CLEANING KIT

Diskette drive heads need periodic maintenance to assure efficient and error-free operation. Unlike other peripheral devices, the read/write head(s) on diskette drives are extremely difficult to clean without partially disassembling the drive. The diskette drive head cleaning kit allows the user to clean the heads in just minutes, without disassembling the drive. Available in 5 1/4" or 8", both single and double sided. Kit contains 2 cleaning diskettes, 4 oz. bottle of CS-85 cleaning solution and an easy pour dispenser.

Weight 12 oz.

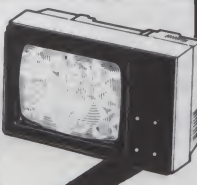
CAT NO.	DESCRIPTION	PRICE
2499	8" Disk Drive Cleaning Kit	\$30.75
2534	5 1/4" Disk Drive Cleaning Kit	\$30.75

HOW TO ORDER

Pay by check, Mastercard, Visa, or C.O.D. Charge card orders please include expiration date. Payment in U.S. dollars only. Order by phone, mail or at our retail store. MINIMUM ORDER \$10.00. Please include phone number and magazine issue you are ordering from. Prices valid thru last day of cover date. SHIPPING: USA: Add \$2.00 for first 2 lbs.; 35¢ each add'l lb. for ground. For AIR add \$3.00 first 2 lbs.; 75¢ each add'l lb. FOREIGN: surface: \$3.00 first 2 lbs.; 60¢ each add'l lb. AIR: \$11.00 first 2 lbs.; \$5.00 each add'l lb. CODs: add \$1.25 add'l. Not responsible for typographical errors. Some items subject to prior sale or quantity limitations. 120 day guaranteed satisfaction. Exception: partially assembled kits.

SEND FOR FREE FLYER, FEATURING:

Page after page of exciting products. Computerized toys and games, personal computers, disk drives, integrated circuits, semi conductors. Add new dimension to your Apple, Atari, TRS-80, etc. with our special application boards and comprehensive software library. Hundreds of products available at terrific Hobbyworld prices. Circle our reader service number or write/phone for your free illustrated flyer today.



Dept. K8

19511 Business Center Drive
Northridge, Calif. 91324

CompuPro S-100 Motherboards: Designed for the Future, **AVAILABLE NOW**

You won't have to throw away these motherboards when you upgrade your system — they are specifically designed to handle the new generation of 5 to 10 MHz CPUs coming on line, as well as present day 2 and 4 MHz systems. Faraday shielding between all bus signal lines minimizes crosstalk; additionally, when signal lines cross each other on opposite sides of the board, they do so at a 90 degree angle to minimize any chance of stray coupling. You'd expect the company that pioneered active termination to include true active termination, but we've gone one step better by splitting the termination load between each end of every bus line. And you won't have to junk your present computer box with our new motherboards — all sizes fit Godbout, Vector, Imsai, TEI, and similar enclosures.

These high-performance motherboards are available in "unkit" form (edge connectors and termination resistors pre-soldered in place for easy assembly), or fully assembled and ready to go.

#CK-024 20 slot motherboard with edge connectors — unkit \$174, assm \$214

#CK-025 12 slot motherboard with edge connectors — unkit \$129, assm \$169

#CK-026 6 slot motherboard with edge connectors — unkit \$89, assm \$129

NOTE: Most CompuPro boards are available in unkit form (sockets, bypass caps pre-soldered in place), assembled, or qualified under the Certified System Component (CSC) high-reliability program (200 hour burn-in, more). CSC memory boards run at 8 MHz, are guaranteed to run with 6 MHz Z-80s, and draw even less power than standard models.

CAREFUL . . . NOT ALL S-100 CPU BOARDS ARE CREATED EQUAL!

You'll appreciate the extras that go into our CPU boards; take IEEE spec compatibility, for example. While others may claim compatibility, we meet all timing specs — and we'll be glad to send you timing diagrams for our CPUs to prove it (just include an SASE). You don't have to compromise on another "me-too" board . . . choose CompuPro.

THE ENHANCED/ADVANCED Z-80A S-100 CPU BOARD

Superior design in an IEEE-compatible board gives the power for future expansion as well as system flexibility. Includes all standard Z-80A features along with power on jump/clear, on-board fully maskable interrupts for interrupt-driven systems, selectable automatic wait state insertion, provision for adding up to 8K of on-board EPROM, 4 MHz operation, and IEEE compatible 16/24 bit extended addressing. **\$225 unkit, \$295 assm, \$395 CSC.**

THE COMPUPRO "RAM" SERIES OF STATIC MEMORY

Recommended for commercial, industrial, and scientific applications. 4/5 MHz standard operation, no dynamic timing problems, meets all IEEE specifications, low power/high speed chips used throughout, extensive bypassing, careful thermal design.

S-100 STANDARD MEMORY	unkit	assm	CSC
8K RAM IIA	\$169	\$189	\$239
16K RAM X-16	\$329	\$379	\$479
24K RAM XX-24	\$449	\$499	\$599
32K RAM X-32	\$599	\$689	\$789

S-100 EXTENDED ADDRESSING MEMORY

(16/24 address lines; addressable on 4K boundaries)

16K RAM XIV	\$299	\$349	\$429
-----------------------	-------	-------	-------

S-100 BANK SELECT MEMORY

(Cromemco etc. compatible; addressable on 4K boundaries)

16K RAM XIII-A-16	\$349	\$419	\$519
24K RAM XIII-A-24	\$479	\$539	\$649
32K RAM XIII-A-32	\$649	\$729	\$849

SBC/BLC MEMORY

32K RAM XI	n/a	n/a	\$1050
----------------------	-----	-----	--------

OTHER S-100 BUS PRODUCTS

Godbout Computer Enclosure	\$289 desktop, \$329 rack mount
Active Terminator Board	\$34.50 kit
2708 EPROM Board (less EPROMs)	\$85 unkit
Memory Manager Board	\$59 unkit, \$85 assm, \$100 CSC
25 "Interfacer I" I/O Board	\$199 unkit, \$249 assm, \$324 CSC
3P Plus S "Interfacer II" I/O Board	\$199 unkit, \$249 assm, \$324 CSC
Mullen Extender Board	\$59 kit
Mullen Relay/Opto-Isolator Control Board	\$129 kit, \$179 assm
Vector 8800V S-100 Prototyping Board	\$19.95

TERMS: Cal res add tax. Allow 5% for shipping, excess refunded. VISA®/Mastercard® orders (\$25 min) call (415) 562-0636, 24 hrs. COD OK with street address for UPS. Prices good through cover month of magazine.

NEW! S-100 DUAL PROCESSOR CPU BOARD

The **Dual Processor Board** is here . . . and CPU boards will never be the same again. 8088 CPU gives true 16 bit power with a standard 8 bit S-100 bus; an 8085 gives compatibility with CP/M and 8080 software. Accesses up to 16 megabytes of memory, meets all IEEE S-100 bus specifications, runs 8085 and 8086 code in your existing mainframe as well as Microsoft 8086 BASIC and Sorcim PASCAL/M™, runs at 5 MHz for speed as well as power, and is built to the same stringent standards that have established our leadership in S-100 bus components. **Introductory prices: \$385 unkit, \$495 assm, \$595 CSC.**

8085 single processor version of above: **introductory prices \$235 unkit, \$325 assm, \$425 CSC.**

SPECTRUM S-100 COLOR GRAPHICS BOARD

Includes 8K of IEEE-compatible static RAM; full duplex bidirectional parallel I/O port for keyboard, joystick, etc. interface; and 6847-based graphics generator that can display all 64 ASCII characters. 10 modes of operation, from alphanumeric/semi-graphics in 8 colors to ultra-dense 256 x 192 full graphics. 75 Ohm RS-170 line output and video output for use with FCC approved modulators. **Introductory prices: \$339 unkit, \$399 assm, \$449 CSC.** Don't settle for black and white graphics or stripped-down color boards; specify the CompuPro Spectrum.

Want graphics software? Sublogic's **2D Universal Graphics Interpreter** (normally \$35) is yours for \$25 with any Spectrum board purchase.

16K DYNAMIC RAM SPECIAL: 8/\$59!

Expand memory in TRS-80® -I and -II, as well as machines made by Apple, Exidy, Heath H89, newer PETs, etc. Low power, high speed (4 MHz). Add \$3 for 2 dip shunts plus TRS-80® conversion instructions. Limited quantity. *TRS-80 is a trademark of the Tandy Corporation.

PASCAL/M™ + MEMORY SPECIAL

PASCAL — easy to learn, easy to apply — can give a microcomputer with CP/M more power than many minis. We supply a totally standard **Wirth PASCAL/M™ 8" diskette** by Sorcim, with manual, for **\$150 with the purchase of any memory board.** Specify Z-80 or 8080/8085 version. PASCAL/M™ available separately for \$175; manual available separately for \$10.

COMING SOON!

We've got a new board coming up that's so versatile some of our people have nicknamed it the "smorgasboard": it includes (among other things) a real-time clock, interval timer, interrupt controllers, and math processor. We've also got a board in the works that greatly enhances the throughput and performance of multi-user (2 or more terminal) systems, by assuming a lot of the overhead functions normally handled by the main CPU. Look for more details on these useful and functional products in the months ahead, or check with finer computer stores for additional information on these and other CompuPro products.

CompuPro™
Bldg. 725, Oakland Airport, CA 94614

from **GODBOUT**
ELECTRONICS

✓ 42

7400 74LS00

SN7400N	19	SN74123N	59	74LS00N	35	74LS164N	1.19
SN7401N	22	SN74125N	39	74LS01N	28	74LS165N	.89
SN7402N	22	SN74126N	44	74LS02N	28	74LS166N	2.48
SN7403N	22	SN74128N	59	74LS03N	28	74LS168N	1.89
SN7404N	22	SN74132N	69	74LS04N	39	74LS169N	1.89
SN7405N	23	SN74136N	95	74LS05N	28	74LS170N	1.99
SN7406N	23	SN74139N	95	74LS06N	39	74LS173N	.89
SN7407N	23	SN74141N	69	74LS07N	39	74LS174N	.99
SN7408N	23	SN74142N	2.95	74LS08N	28	74LS175N	.99
SN7409N	23	SN74143N	2.95	74LS11N	39	74LS181N	2.20
SN7410N	22	SN74144N	2.95	74LS12N	39	74LS180N	1.15
SN7411N	29	SN74145N	62	74LS13N	47	74LS191N	1.15
SN7412N	29	SN74147N	1.95	74LS14N	1.25	74LS193N	.98
SN7413N	39	SN74148N	1.20	74LS15N	39	74LS193N	.98
SN7414N	59	SN74150N	99	74LS20N	26	74LS194N	1.15
SN7416N	29	SN74151N	67	74LS21N	38	74LS195N	.89
SN7417N	29	SN74152N	67	74LS22N	38	74LS196N	.89
SN7420N	22	SN74153N	67	74LS26N	39	74LS197N	.89
SN7421N	35	SN74154N	1.19	74LS27N	39	74LS221N	1.49
SN7422N	29	SN74155N	82	74LS28N	39	74LS240N	2.99
SN7423N	29	SN74156N	89	74LS30N	26	74LS241N	2.49
SN7425N	29	SN74157N	89	74LS32N	39	74LS242N	2.29
SN7426N	29	SN74158N	1.65	74LS37N	79	74LS243N	2.29
SN7427N	29	SN74160N	95	74LS38N	39	74LS244N	2.95
SN7428N	29	SN74161N	95	74LS40N	28	74LS245N	8.95
SN7430N	23	SN74162N	89	74LS42N	79	74LS247N	1.10
SN7432N	29	SN74163N	87	74LS47N	79	74LS248N	1.10
SN7433N	29	SN74164N	97	74LS48N	79	74LS249N	1.89
SN7434N	29	SN74165N	97	74LS51N	28	74LS251N	1.79
SN7435N	29	SN74166N	1.20	74LS55N	35	74LS253N	.98
SN7440N	24	SN74187N	1.95	74LS55N	35	74LS257N	.98
SN7441N	79	SN74170N	1.69	74LS57N	45	74LS258N	.98
SN7442N	57	SN74172N	5.95	74LS74N	59	74LS259N	2.95
SN7443N	79	SN74173N	79	74LS78N	59	74LS260N	1.19
SN7444N	79	SN74174N	89	74LS78N	45	74LS281N	2.49
SN7445N	79	SN74175N	89	74LS78N	85	74LS266N	.59
SN7446N	79	SN74176N	85	74LS83AN	99	74LS273N	1.75
SN7447N	79	SN74177N	85	74LS112N	1.19	74LS275N	4.40
SN7448N	79	SN74179N	1.80	74LS166N	45	74LS279N	.59
SN7450N	23	SN74180N	75	74LS180N	75	74LS283N	1.10
SN7451N	23	SN74181N	1.75	74LS182N	75	74LS290N	1.29
SN7453N	23	SN74182N	1.75	74LS183N	75	74LS293N	1.95
SN7454N	23	SN74184N	1.95	74LS184N	88	74LS296N	1.10
SN7459N	29	SN74185N	1.95	74LS186N	98	74LS296N	1.29
SN7460N	23	SN74186N	9.95	74LS187N	98	74LS324N	1.75
SN7470N	39	SN74188N	3.90	74LS189N	45	74LS347N	1.95
SN7472N	34	SN74190N	1.15	74LS112N	1.19	74LS348N	1.95
SN7473N	36	SN74191N	1.15	74LS113N	49	74LS352N	1.85
SN7474N	36	SN74192N	85	74LS114N	55	74LS353N	1.85
SN7475N	36	SN74193N	85	74LS112N	55	74LS356N	1.49
SN7476N	36	SN74194N	85	74LS123N	55	74LS356N	1.49
SN7479N	4.60	SN74195N	85	74LS124N	1.35	74LS366N	.99
SN7480N	59	SN74196N	85	74LS125N	89	74LS367N	.99
SN7481N	1.10	SN74197N	85	74LS128N	89	74LS368N	.99
SN7482N	1.10	SN74198N	1.39	74LS128N	89	74LS373N	2.75
SN7483N	5.50	SN74199N	1.39	74LS138N	89	74LS374N	2.75
SN7485N	65	SN74221N	1.39	74LS138N	89	74LS375N	.89
SN7486N	65	SN74251N	1.05	74LS138N	89	74LS377N	1.95
SN7489N	1.75	SN74252N	1.05	74LS145N	1.25	74LS385N	1.95
SN7490N	39	SN74279N	89	74LS148N	1.49	74LS386N	.85
SN7491N	85	SN74283N	2.15	74LS151N	79	74LS390N	1.95
SN7492N	52	SN74284N	3.90	74LS153N	79	74LS393N	1.95
SN7493N	46	SN74285N	3.90	74LS154N	2.49	74LS395N	1.70
SN7494N	72	SN74290N	1.25	74LS155N	1.19	74LS396N	2.95
SN7495N	65	SN74298N	95	74LS156N	99	74LS424N	2.95
SN7496N	72	SN74365N	88	74LS157N	99	74LS468N	1.75
SN7497N	3.10	SN74366N	88	74LS158N	75	74LS470N	2.29
SN74100N	99	SN74367N	79	74LS160N	98	74LS471N	1.99
SN74107N	32	SN74368N	79	74LS161N	1.15	74LS472N	1.99
SN74109N	53	SN74390N	1.90	74LS162N	98	74LS473N	1.99
SN74116N	1.95	SN74393N	1.90	74LS163N	98	74LS474N	1.99
SN74121N	29	SN74490N	1.90				
SN74122N	39						

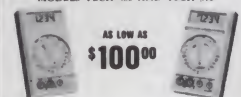
CMOS LINEAR

CD4000	29	CD4093	95	78H05	5.95	LM1414N	1.90
CD4001	29	CD4094	2.95	78M05	1.49	LM1458CN/N	1.49
CD4002	29	CD4098	2.49	LM105H	99	LM1489N	1.49
CD4006	1.39	CD4099	2.25	LM108AH	2.95	LM1489N	.89
CD4007	29	MC14408	12.95	LM300H	79	LM158N	1.50
CD4008	1.39	MC14409	12.95	LM301CN/H	35	LM1820N	.79
CD4009	59	MC14410	12.95	LM304H	98	LM1820N	.95
CD4010	59	MC14412	12.95	LM305H	89	LM1850N	.95
CD4011	29	MC14415	8.95	LM306H	3.25	LM1889N	3.95
CD4012	29	MC14419	4.95	LM307CN/H	39	LM2111N	1.75
CD4013	49	CD4501	39	LM308CN/H	98	LM2900N	.99
CD4014	1.39	CD4502	1.65	LM309K	1.49	LM2901N	2.50
CD4015	1.39	CD4503	.89	LM310CN	1.25	LM2917N	2.95
CD4016	59	CD4505	8.95	LM311CN/H	98	CA3013T	2.29
CD4017	1.19	CD4506	75	LM312H	1.75	CA3017	1.99
CD4018	1.19	CD4507	.95	LM317T	2.75	CA3021T	3.49
CD4019	49	CD4508	3.95	LM318CN/H	1.49	CA3023T	2.99
CD4020	1.19	CD4510	1.39	LM319H/N	1.25	CA3035T	2.75
CD4021	1.49	CD4511	1.39	LM320K/XX	1.49	CA3039T	1.49
CD4022	1.29	CD4512	1.39	LM320T/XX	1.25	CA3040N	1.29
CD4023	36	CD4515	3.95	LM320H/XX	1.25	LM3053N	1.49
CD4024	79	CD4518	1.89	LM323K	4.95	CA3059N	3.25
CD4025	36	CD4518	1.39	LM324N	1.25	CA3060N	3.25
CD4027	79	CD4520	1.39	LM325N	95	CA3062N	4.95
CD4028	99	CD4555	4.95	LM340K/XX	1.49	LM3065N	1.49
CD4029	1.29	CD4556	99	LM340T/XX	1.25	CA3080N	1.29
CD4030	89	CD4588	2.25	LM340H/XX	1.25	CA3081N	1.89
CD4031	3.25	74C01	.39	LM344H	1.95	CA3082N	1.89
CD4032	2.15	74C02	.39	LM348N	1.85	CA3083N	1.99
CD4034	3.25	74C04	.39	LM358CN	98	CA3086N	1.29
CD4035	1.19	74C08	.49	LM360N	1.49	CA3088N	2.75
CD4037	1.89	74C10	.49	LM372N	1.95	CA3096N	2.49
CD4040	1.29	74C14	1.65	LM376N	3.75	CA3097N	1.99
CD4041	1.25	74C20	.39	LM377N	3.75	CA3130T	2.49
CD4042	99	74C30	.39	LM380CN/N	1.25	CA3140T	2.49
CD4043	99	74C32	.39	LM381N	1.79	CA3146N	2.49
CD4044	99	74C42	1.85	LM383T	1.95	CA3160T	1.49
CD4046	2.25	74C48	2.39	LM386N	1.49	CA3190N	1.95
CD4047	1.25	74C73	.99	LM387N	1.49	CA3401N	.89
CD4048	89	74C74	.99	LM390N	1.95	MC3423N	1.49
CD4049	89	74C85	2.49	NE531V/T	3.75	MC3460N	3.95
CD4050	89	74C89	4.95	NE555V	39	SG3524N	3.95
CD4051	1.10	74C90	1.85	NE556N	98	CA3600N	3.50
CD4052	1.10	74C93	1.85	NE561T	19.95	LM3900N	.59
CD4053	1.10	74C95	1.85	NE562B	7.95	LM3905N	1.49
CD4055	3.95	74C107	1.19	NE565H/V	1.25	LM3905N	.98
CD4056	2.95	74C151	2.49	NE568H/V	1.75	RC4131N	2.95
CD4058	9.95	74C154	3.50	NE569H/V	1.50	RC4136N	1.10
CD4060	1.39	74C157	2.10	NE592N	2.10	CA1415N	1.75
CD4066	89	74C160	2.39	LM702H	2.99	RC4194	4.95
CD4069	89	74C181	2.30	LM709N/H	29	RC4195	4.40
CD4070	89	74C183	2.39	LM710N/H	29	ULN2001	1.25
CD4071	89	74C184	2.39	LM711N/H	29	ULN2002N	1.50
CD4072	35	74C173	2.59	LM715N	1.95	SN75450N	.59
CD4073	35	74C174	2.75	LM723N/H	75	SN75451N	.49
CD4075	35	74C175	2.75	LM733N/H	98	SN75452N	.49
CD4076	1.29	74C182	2.39	LM739N	1.15	SN75453N	.49
CD4077	35	74C193	2.39	LM741CN/H	33	SN75454N	.49
CD4078	35	74C195	2.39	LM741CN-14	19	SN75491N	.89
CD4081	35	74C222	7.95	LM747N/H	79	SN75492N	.89
CD4082	35	74C223	8.95	LM748N/H	79	SN75493N	.89
CD4085	1.95	MM580C95	1.50	LM760CN	2.95	SN75494N	.89
CD4089	2.95	MM580C97	1.25	LM1310N	1.90		

RETAIL STORES OPEN MON-SAT
 STORE #1 1310 "B" E. Edinger Santa Ana, CA 92705 Showrooms, Retail, Warehouse
 STORE #2 674 El Camino Real Tustin, CA 92680 Specializing in Systems

BECKMAN Digital Multimeters

MODELS TECH 310 AND TECH 310



AS LOW AS \$100.00
 Choice of Models - The TECH 310 has all above features, 7 functions, 29 ranges plus 0.25% Vdc accuracy. The TECH 310 has all above features and all the above features, but without true-RMS™ continuity function or the 10 amp current source.
 TECH 310 Digital Multimeter \$100.00
 TECH 310 Vinyl Carrying Case \$10.00
 DC-202 Deluxe Carrying Case \$24.00
 HV-211 High Voltage Probe \$35.00
 RP-221 RF Probe \$35.00
 CR-231 AC Current Clamp \$42.00
 DL-241 Deluxe Test Lead Kit \$10.00
 TL-242 Spare Test Leads \$6.00 (6 pcs.)

ACF APPLE MUSIC MACHINE

WITH 9 VOICES!
 • NEW Uses latest State of the Art LSI Technology.
 • Requires only one slot for 9 voices • Uses three AT-8910's to produce nine voices (Other computers use one chip only 3 voices) • Includes software • Simulates three ALF boards • Plays music generated by the ALF board • APPLE II compatible
 3 Times More Powerful Than ALF!
 KIT \$199.95
 ASSEMBLY AND TESTS \$299.95

THE BONE FONE

• SKIERS
 • JOGGERS
 • SKATERS
 • CYCLERS
 You must hear it and feel it to believe it!
 AM/FM stereo surrounds and fills your body with sound. No earplugs. You wear it!
 \$65.95

FLOPPY DISK DRIVES

MPI B51-51A, 40 tracks \$279.00
 Shugart SA400-51A 35 tracks \$295.00
 Shugart 800/801F 8" \$475.00
 FDD-120-80 \$429.00
 PERSCI Model 277 Dual \$1195.00
 WANG/SIEMENS 51A Drive \$299.00
 MPI B52 51A Dual \$395.00
 WANG/SIEMENS 282 Dual 51A \$395.00
 WANG/SIEMENS 82 \$290.00

MONITORS

ADVANCED COMPUTER PRODUCTS

GET YOUR 1980 CATALOG

FIRST TO OFFER PRIME PRODUCTS TO THE HOBBYIST AT FAIR PRICES!

1. Proven Quality Factory tested products only.
 2. Guaranteed Satisfaction
 3. Over \$1,000,000.00 Inventory
- ## 1980 CATALOG NOW AVAILABLE.

Send \$2.00 for your copy of the most complete catalog of computer products. A must for the serious computer user.

STATIC RAM BOARDS

S-100 32K (uses 2114)
ASSEMBLED KIT
 450ns. 499.00
 250ns. 539.00
 Bare Board 49.95
 Bare Board w/all parts less mem. 99.95

S-100 16K (S-100 Compatible)

- Low Power
- 2 MHz or 4 MHz
- Assembled & Tested

WOW!



LOGOS 18K
ASSEMBLED KIT
 450 ns 149.95
 250ns. 169.95
 Bare PCB Board w/Data Head 521.95
 Special Offer Buy (4) 8K 450ns. Kits \$117.00

The VISTA V-80 Disk Drive System
 • 22% more storage capacity than TR-80
 • 120 day warranty
 • 400 track pitch at NO CHARGE

THE VISTA V-200 FOR EXIDY

Price: Starting as low as \$1199.00

Item	Capacity	Drive	Price
V200 E-20	20	Single Head	1199.00
V200 E-22	80	2 Drive, 250ns	1549.00
V200 E-30	600	3 Drive, 320ns	1524.00
V200 E-32	12 MEG	3 Drive, 320ns	1999.00

ATTENTION VIDEO HOBBYISTS!!!

- BOX BUILDERS
- USE AS REMOTE TUNER/TIMER
- FULL SCHEMATICS AVAILABLE
- FOR ONLY \$5.95 - FREE W/PURCHASE

A Recent Special Purchase Allows Us To Present The Following:

NEW, UNUSED COMPONENTS From The RCA VDT-201 Videocassette Recorder

- 1 UNFMT Tuner Subassembly with all kinds and Video Demodulator \$59.95
- 2 RF Modulator with Audio & Video inputs, Channel 3 or 4 Output \$39.95
- 3 Digital Clock Module AM/PM Fluorescent Resistor (Green) \$2.49
- 4 300 Ohm to 75 Ohm Matching or 50 Ohm to 75 Ohm Matching \$2.49
- 5 Complete Set of All The Above \$123.34

For Only \$74.95

Please Call For Volume Discounts

LOW COST FLOPPY DISK SUBSYSTEM

Shugart 801R Drives (2) VISTA Floppy Controller 1200, Cable, Power Supply & Cable, CP/M Disk Operating System Assembled & Tested \$149.00
 • CHECK OUR FLOPPY DISK PRICING ON THIS PAGE (Save \$300.00) (\$1799.00 Value)

WATANABE MIPLLOT

Max pen speed 50 mm/sec, resolution 10 mm typically, 10 mm built-in character generator scans degrees of rotation, absolute drive relative drive, simple printing with simple commands \$1195.00

IMS STATIC RAM BOARDS

	250 ns.	450 ns.
16K Static	\$209.00	\$189.00
8K Static	\$249.00	\$219.00
32K Static	\$729.00	\$629.00

ANADIX PRINTER NEW APPLE VERSION

Model DP-8000 compact, impact, parallel or serial. Sprocket feed, 80 cols, 84 lines/min., bi-directional.
 New only \$875.00
 DP-8000AP (for Apple) \$875.00

SALE! SD SYSTEMS BOARDS TAKE 10% OFF!

Model No.	Description	Price
SBC 100 Single Board Computer (2MHz)	\$285.00	\$349.00
SBC 200 Single Board Computer (4MHz)	299.00	399.00
Z80 Starter System	319.00	449.00
V08 8024 Video Display Board	335.00	459.00
VersaFloppy II	325.00	429.00
Expander PWBKA	115.00	225.00
SD100 Computer System w/64K	-	699.00
SD200 Computer System w/64K	-	799.00

6800 MICROMODULE™ PRICE LIST

Model No.	Description	Price
9600A	Single Board Microcomputer	\$495.00
9609	Advanced Single Bd. Comp. (6809)	595.00
9601	16 Slot Mother Board	175.00
9602	Card Cage	75.00
9603	8 Slot Mother Board	100.00
9604	Power Supply	275.00
9605	DC Input Power Supply	325.00
9610	Utility Proto Board	49.00
9611	Arith. Proc/Memory Module	495.00
9612	Buffered Utility Proto Board	39.00
9616	32K EPROM/RAM Module	250.00
9617	EPROM Programming Head	250.00
9620	16 Channel Parallel I/O Module	295.00
9622	Serial-Parallel I/O Module	325.00
9627	16K Static RAM Module 470ns	395.00
9629	32K Static RAM 450ns	695.00
9629A	32K Static RAM 200ns	695.00
9630	Card Extender	69.00
9640	Multiple Programmable Timer	395.00
9650	8 Channel Duplex Serial I/O Mod.	395.00
9655	Intelligent Tape Controller	550.00
96103	32/32 I/O Module	275.00
96702	Contact Closure Module	350.00

UNPOPULATED BOARDS (Also Available)

APPLE/EXIDY/EXPANDO TRS 80 16K-UPGRADE KIT

\$54.95 TRS-80/APPLE \$54.95

MEMORY EXPANSION KITS,

4116's, 16K (200/250 ns.)

8 pcs for \$54.95

w/Instructions & Jumpers

Call For Volume Pricing

- * Special: TRS80 Schematic..... \$ 4.95
- * Expansion Interface Schematic..... \$ 4.95
- * Expansion Interface Connector..... 7.95

EXPANDOR II MEMORY KITS

- * Bank Selectable * Uses 4116 200 ns.
- * Write Protect * Power 8VDC, ±16VDC
- * Phantom * Low Power * Up to 4 MHz

Expando 64 Kit (4116) Assem. & Tested Add \$50

16K \$269.00 48K \$435.00

32K \$349.00 64K \$505.00

HAZELTINE TERMINALS

SALE \$749.00

Model 1400 \$749.00 Model 1500 \$1085.00

Model 1410 \$825.00 Model 1510 \$1245.00

Model 1420 \$945.00 Model 1520 \$1495.00

UV "Eeprom" Eraser

Model Uva-11E \$69.95

Holds 4 Eprom's at a time

Backed by 45 years experience.

Model S-52T...\$265.00

Professional Industrial Model

EMAKO-20.. Reg. \$777.00 \$599.00

UNBELIEVABLE!

125 Caps, 60 Ipm-Vertical

Formal Unit - 96 Characters

Upper/Lower Case, 4.5" to 9.5" Adjustable

80 col/40 col double width - Full 96 char. ASCII

Model S-52T...\$265.00

EMAKO-22..... \$799.00

Prints a 132 col. line. Available with parallel or serial output at same price.

MIKA 20..... \$1280.00

9x7, 125 cps, 136 characters/line

Full 15" width. Super for business applications requiring large IBM format paper.

BASE II PRINTER

80 Column Impact Printer

• 60 Lines Per Minute

• 115/230 VAC, 50 or 60 Hz

• 72, 80, 96, 120 or 132 Char/Line

• Self-Test Switch

Option "M" Terminal Screen Buffer (1920 Char.) \$50.00

Option "S" High Speed Paper Advance & Graphics \$50.00

Option "T" Tractor Feed \$50.00

Z-80/Z-80A/8080 CPU BOARD

- * On board 2708 * 2708 included (450ns.)
- * Power on jump * completely socketed
- * Z-80 Assembled and Tested..... \$155.00
- * Z-80 Kit..... \$129.95
- * Z-80 Bare PC Board..... \$34.95
- * For 4MHz Speed Add \$15.00

8080A Assembled..... \$99.95

8080A Assembled..... \$149.95

S-100 MOTHERBOARD SPECIAL

8 slot expandable w/9 conn. Reg \$69.95... NOW \$52.95

SIEMENS'S FLOPPY

- * Special buy while supply lasts
- * 8" Drive with Double-Density
- * 90 Day Warranty

• CHECK OUR FLOPPY DISK PRICING ON THIS PAGE

801R \$475.00

ACUSTIC MODEM

NOVATION CAT™

0-300 Baud

Ball 1-03

Answer, Originate \$179.95

DATA BOOKS * COMPUTER BOOKS

1980 IC Master 59.95 Intel MCS 80 Manual..... 7.95

NSC TTL Data..... 3.95 Intel MCS-40 Manual..... 4.95

NSC Linear Data..... 4.95 AMD 8080A Manual..... 5.95

NSC Linear App Note II..... 3.95 AMD Schottky Data..... 4.95

NSC CMOS..... 3.95 Intel MCS-85 Data..... 4.95

Intel Data Book..... 3.95 GI MOS/LSI Data..... 4.95

Intel MCS 85 Manual..... 7.50 TI Linear Control Data..... 8.95

SALE * OSBORNE BOOKS * SALE

Intro to Micro Vol. 1..... 7.95

Intro to Micro Vol. 2..... 7.95

8080A Programming..... 7.95

8080 Programming..... 7.95

Z80 Programming..... 7.95

Vol. II: Some Real Support Devices w/Binder..... 29.95

Intro to Micro Vol. II..... 7.95

SALE * BILTMORE COMPUTER BOOKS * SALE

Understanding Computers..... 7.95

Beginning BASIC..... 7.95

Beginners Glossary & Guide..... 7.95

Personal Budget & Jelly Guide to Computers..... 7.95

8080 Machine Language Programming..... 7.95

Home Computers Vol. I Hardware..... 7.95

Home Computers Vol. II Software..... 7.95

Storing Simulator..... 7.95

MICROPROCESSORS

2801 18 bit to 8Mb..... \$189.00

2802 18 bit to 8Mb..... \$189.00

2803 18 bit to 8Mb..... \$189.00

2804 18 bit to 8Mb..... \$189.00

2805 18 bit to 8Mb..... \$189.00

2806 18 bit to 8Mb..... \$189.00

2807 18 bit to 8Mb..... \$189.00

2808 18 bit to 8Mb..... \$189.00

2809 18 bit to 8Mb..... \$189.00

2810 18 bit to 8Mb..... \$189.00

2811 18 bit to 8Mb..... \$189.00

2812 18 bit to 8Mb..... \$189.00

2813 18 bit to 8Mb..... \$189.00

2814 18 bit to 8Mb..... \$189.00

2815 18 bit to 8Mb..... \$189.00

2816 18 bit to 8Mb..... \$189.00

2817 18 bit to 8Mb..... \$189.00

2818 18 bit to 8Mb..... \$189.00

2819 18 bit to 8Mb..... \$189.00

2820 18 bit to 8Mb..... \$189.00

2821 18 bit to 8Mb..... \$189.00

2822 18 bit to 8Mb..... \$189.00

2823 18 bit to 8Mb..... \$189.00

2824 18 bit to 8Mb..... \$189.00

2825 18 bit to 8Mb..... \$189.00

2826 18 bit to 8Mb..... \$189.00

2827 18 bit to 8Mb..... \$189.00

2828 18 bit to 8Mb..... \$189.00

2829 18 bit to 8Mb..... \$189.00

2830 18 bit to 8Mb..... \$189.00

2831 18 bit to 8Mb..... \$189.00

2832 18 bit to 8Mb..... \$189.00

2833 18 bit to 8Mb..... \$189.00

2834 18 bit to 8Mb..... \$189.00

2835 18 bit to 8Mb..... \$189.00

2836 18 bit to 8Mb..... \$189.00

2837 18 bit to 8Mb..... \$189.00

2838 18 bit to 8Mb..... \$189.00

2839 18 bit to 8Mb..... \$189.00

2840 18 bit to 8Mb..... \$189.00

2841 18 bit to 8Mb..... \$189.00

2842 18 bit to 8Mb..... \$189.00

2843 18 bit to 8Mb..... \$189.00

2844 18 bit to 8Mb..... \$189.00

2845 18 bit to 8Mb..... \$189.00

2846 18 bit to 8Mb..... \$189.00

2847 18 bit to 8Mb..... \$189.00

2848 18 bit to 8Mb..... \$189.00

2849 18 bit to 8Mb..... \$189.00

2850 18 bit to 8Mb..... \$189.00

2851 18 bit to 8Mb..... \$189.00

2852 18 bit to 8Mb..... \$189.00

2853 18 bit to 8Mb..... \$189.00

2854 18 bit to 8Mb..... \$189.00

2855 18 bit to 8Mb..... \$189.00

2856 18 bit to 8Mb..... \$189.00

2857 18 bit to 8Mb..... \$189.00

2858 18 bit to 8Mb..... \$189.00

2859 18 bit to 8Mb..... \$189.00

2860 18 bit to 8Mb..... \$189.00

2861 18 bit to 8Mb..... \$189.00

2862 18 bit to 8Mb..... \$189.00

2863 18 bit to 8Mb..... \$189.00

2864 18 bit to 8Mb..... \$189.00

</

Explorer/85

100% compatible with all 8080A and
8085 software & development tools!

No matter what your future computing plans may
be, Level "A"—at \$129.95—is your starting point.

Starting at just \$129.95 for a Level "A" operating system,
you can now build the exact computer you want. Explorer/85
can be your beginner's system, OEM controller, or IBM-
formatted 8" disk small business system... yet you're never
forced to spend a penny for a component or feature you don't
want and you can expand in small, affordable steps!

Now, for just \$129.95, you can own the first level of a fully
expandable computer with professional capabilities—a com-
puter which features the advanced Intel 8085 cpu, thereby
giving you immediate access to all software and development
tools that exist for both the 8085 and its 8080A predecessor
(they are 100% software compatible)—a computer which
features onboard S-100 bus expansion—plus instant conver-
sion to mass storage disk memory with either 5-1/4" diskettes
or standard IBM-formatted 8" disks.

For just \$129.95 (plus the cost of a power supply, keyboard/
terminal and RF modulator, if you don't have them already),
Explorer/85 lets you begin computing on a significant level...
applying the principles discussed in leading computer maga-
zines... developing "state of the art" computer solutions for
both the industrial and leisure environment.

Level "A" Specifications

Explorer/85's Level "A" system features the advanced Intel
8085 cpu, an 8355 ROM with 2k deluxe monitor/operating
system, and an 8155 ROM-I/O—all on a single motherboard
with room for RAM/ROM/PROM/EPROM and S-100 expan-
sion, plus generous prototyping space.

(Level "A" makes a perfect OEM controller for industrial
applications and is available in a special Hex Version which
can be programmed using the Netronics Hex Keypad/
Display.)

PC Board: glass epoxy, plated
through holes with solder mask
• I/O: provisions for 25-pin
(DB25) connector for terminal
serial I/O, which can also sup-
port a paper tape reader
...provision for 24-pin DIP
socket for hex keyboard/dis-
play... cassette tape recorder in-
terface.

Level "A" at \$129.95 is a
complete operating system,
perfect for beginners, hob-
biests, or industrial con-
troller use.
...cassette tape recorder output... cassette tape control
output... speaker output... LED output indicator on SOD
(serial output) line... printer interface (less drivers)... total of
four 8-bit plus one 6-bit I/O ports • Crystal Frequency: 6.144
MHz • Control Switches: reset and user (RST 7.5)
interrupt... additional provisions for RST 5.5, 6.5 and TRAP
interrupts onboard • Counter/Timer: programmable, 14-bit
binary • System RAM: 256 bytes located at F800, ideal for
smaller systems and for use as an isolated stack area in
expanded systems... RAM expandable to 64k via S-100 bus or
4K on motherboard.

System Monitor (Terminal Version): 2k bytes of deluxe
system monitor ROM located at F000 leaving 0000 free for user
RAM/ROM. Features include tape load with labeling... tape
dump with labeling... examine/change contents of memory
...insert data... warm start... examine and change all
registers... single step with register display at each break point,
a debugging/training feature... go to execution address...
move blocks of memory from one location to another... fill
blocks of memory with a constant... display blocks of memory
... automatic baud rate selection... variable display line length
control (1-255 characters/line)... channelized I/O monitor
routine with 8-bit parallel output for high speed printer...
serial console in and console out channel so that monitor can
communicate with I/O ports.

System Monitor (Hex Version): Tape load with labeling...
tape dump with labeling... examine/change contents of mem-
ory... insert data... warm start... examine and change all

Netronics R&D Ltd.

333 Litchfield Road, New Milford, CT 06776

Please send the items checked below—

- ☐ Explorer/85 Level "A" Kit (ASCII Version), \$129.95 plus \$3 p&h.
- ☐ Explorer/85 Level "A" Kit (Hex Version), \$129.95 plus \$3 p&h.
- ☐ 8k Microsoft BASIC on cassette tape, \$64.95 postpaid.
- ☐ 8k Microsoft BASIC in ROM Kit (requires Levels "B," "D," and "E"), \$99.95 plus \$2 p&h.
- ☐ Level "B" (S-100) Kit, \$49.95 plus \$2 p&h.
- ☐ Level "C" (S-100 6-card expander) Kit, \$39.95 plus \$2 p&h.
- ☐ Level "D" (4k RAM) Kit, \$69.95 plus \$2 p&h.
- ☐ Level "E" (EPROM/ROM) Kit, \$5.95 plus \$0.00 p&h.
- ☐ Deluxe Steel Cabinet for Explorer/85, \$49.95 plus \$3 p&h.
- ☐ ASCII Keyboard/Computer Terminal Kit (features a full 128 character set, upper & lower case, full cursor control, 75 ohm video output convertible to baudot output, selectable baud rate, RS232-C or 20 ma. I/O, 32 or 64 character by 16 line formats, and can be used with either a CRT monitor or a TV set (if you have an RF modulator), \$149.95 plus \$2.50 p&h.
- ☐ Hex Keypad/Display Kit, \$69.95

plus \$2 p&h.

- ☐ Deluxe Steel Cabinet for ASCII Keyboard/Terminal, \$19.95 plus \$2.50 p&h.
- ☐ Power Supply Kit (±8V @ 5 amps) in deluxe steel cabinet, \$39.95 plus \$2 p&h.
- ☐ Gold Plated S-100 Bus Connectors, \$4.85 each, postpaid.
- ☐ RF Modulator Kit (allows you to use your TV set as a monitor), \$8.95 postpaid.
- ☐ 16k RAM Kit (S-100 Board expands to 64k), \$199.95 plus \$2 p&h.
- ☐ 32k RAM Kit, \$329.95 plus \$2 p&h.
- ☐ 48k RAM Kit, \$459.95 plus \$2 p&h.
- ☐ 64k RAM Kit, \$589.95 plus \$2 p&h.
- ☐ 16k RAM Expansion Kit (to expand any of the above up to 64k), \$139.95 plus \$2 p&h each.
- ☐ Intel 8085 cpu User's Manual, \$7.50 postpaid.
- ☐ Special Computer Grade Cassette Tapes, \$1.90 each or 3 for \$5, postpaid.
- ☐ 12" Video Monitor (10 MHz bandwidth), \$139.95 plus \$5 p&h.
- ☐ North Star Double Density Floppy Disk Kit (One Drive) for Explorer/85 (includes 3 drive S-100 controller, DOS, and extended BASIC with per-



registers... single step with register display at each break point
... go to execution address. Level "A" in the Hex Version
makes a perfect controller for industrial applications and can
be programmed using the Netronics Hex Keypad/Display.



Hex Keypad/Display.

Level "B" Specifications

Level "B" provides the S-100 signals plus buffers/drivers to
support up to six S-100 bus boards and includes: address
decoding for onboard 4k RAM expansion select-able in
4k blocks... address decoding for onboard 8k EPROM expan-
sion select-able in 8k blocks... address and data bus drivers for
onboard expansion... wait state generator (jumper select-able),
to allow the use of slower memories... two separate 5 volt
regulators.



Explorer/85 with Level
"C" card cage.

Level "C" includes a sheet metal superstructure, a 5-card gold
plated S-100 extension PC board which plugs into the mother-
board. Just add required number of S-100 connectors

Level "D" Specifications

Level "D" provides 4k or RAM, power supply regulation,
filtering decoupling components and sockets to expand your
Explorer/85 memory to 4k (plus the original 256 bytes located
in the 8155A). The static RAM can be located anywhere from
0000 to FFFF in 4k blocks.

Level "E" Specifications

Level "E" adds sockets for 8k of EPROM to use the popular
Intel 2716 or the TI 2516. It includes all sockets, power supply
regulator, heat sink, filtering and decoupling components.
Sockets may also be used for soon to be available RAM IC's
(allowing for up to 12k of onboard RAM).

Order A Coordinated Explorer/85 Applications Pak!

Experimenter's Pak (SAVE \$12.50)—Buy Level "A" and Hex
Keypad/Display for \$199.90 and get FREE Intel 8085 user's
manual plus FREE postage & handling!

Student Pak (SAVE \$24.45)—Buy Level "A," ASCII Key-
board/Computer Terminal, and Power Supply for \$319.85 and
get FREE RF Modulator plus FREE Intel 8085 user's manual
plus FREE postage & handling!

Engineering Pak (SAVE \$41.00)—Buy Levels "A," "B,"
"C," "D," and "E" with Power Supply, ASCII Keyboard/
Computer Terminal, and six S-100 Bus Connectors for \$514.75
and get 10 FREE computer grade cassette tapes plus FREE
8085 user's manual plus FREE postage & handling!

Business Pak (SAVE \$89.95)—Buy Explorer/85 Levels "A,"
"B," and "C" (with cabinet), Power Supply, ASCII Key-
board/Computer Terminal (with cabinet), 16k RAM, 12"
Video Monitor, North Star 5-1/4" Disk Drive (includes North
Star BASIC) with power supply and cabinet, all for just
\$1599.40 and get 10 FREE 5-1/4" minidiskettes (\$49.95 value)
plus FREE 8085 user's manual plus FREE postage & handling!

Continental U.S.A. Credit Card Buyers Outside Connecticut
CALL TOLL FREE 800-243-7428

To Order From Connecticut Or For Technical
Assistance, Etc. Call (203) 354-9375

sonalized disk operating system—just
plug it in and you're up and running!.

- ☐ Power Supply Kit for North Star
Disk Drive, \$39.95 plus \$2 p&h.
- ☐ Deluxe Case for North Star Disk
Drive, \$39.95 plus \$2 p&h.
- ☐ Experimenter's Pak (see above),
\$199.90 postpaid.
- ☐ Student Pak (see above), \$319.85
postpaid.
- ☐ Engineering Pak (see above),
\$514.75 postpaid.
- ☐ Business Pak (see above), \$1599.40
postpaid.

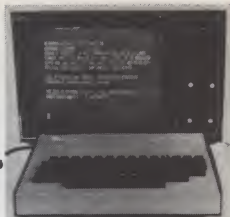
Total Enclosed \$ _____
(Conn. res. add sales tax) By—
☐ Personal Check ☐ M.O./Cashier's
Check ☐ Visa ☐ Master Charge
(Bank # _____)

Acct. # _____
Signature _____ Exp. Date _____
Print Name _____
Address _____
City _____
State _____ Zip _____

☐ Send Me Information

By Netronics

ASCII/BAUDOT,
STAND ALONE



Computer Terminal

COMPLETE
FOR ONLY
\$149.95

The Netronics ASCII/BAUDOT Computer Terminal Kit is a
microprocessor-controlled, stand alone keyboard/terminal
requiring no computer memory or software. It allows the use of
either a 64 or 32 character by 16 line professional display for-
mat with selectable baud rate, RS232-C or 20 ma. output, full
cursor control and 75 ohm composite video output.

The keyboard follows the standard typewriter configuration
and generates the entire 128 character ASCII upper/lower case
set with 96 printable characters. Features include onboard
regulators, selectable parity, shift lock key, alpha lock jumper,
a drive capability of one TTY load, and the ability to mate
directly with almost any computer, including the new Ex-
plorer/85 and ELF products by Netronics.

The Computer Terminal requires no I/O mapping and
includes 1k of memory, character generator, 2 key rollover,
processor controlled cursor control, parallel ASCII/BAUDOT
to serial conversion and serial to video processing—fully
crystal controlled for superb accuracy. PC boards are the
highest quality glass epoxy for the ultimate in reliability and
long life.

VIDEO DISPLAY SPECIFICATIONS

The heart of the Netronics Computer Terminal is the micro-
processor-controlled Netronics Video Display Board (VID)
which allows the terminal to utilize either a parallel ASCII or
BAUDOT signal source. The VID converts the parallel data to
serial data which is then formatted to either RS232-C or 20 ma.
current loop output, which can be connected to the serial I/O
on your computer or other interface, i.e., Modem.

When connected to a computer, the computer must echo the
character received. This data is received by the VID which
processes the information, converting to data to video suitable
to be displayed on a TV set (using an RF modulator) or on a
video monitor. The VID generates the cursor, horizontal and
vertical sync pulses and performs the housekeeping relative to
which character and where it is to be displayed on the screen.

Video Output: 1.5 P/P into 75 ohm (EIA RS-170) • Baud Rate:
110 and 300 ASCII • Outputs: RS232-C or 20 ma. current loop
• ASCII Character Set: 128 printable characters—

! " # \$ % & ' () * + , - . / 0 1 2 3 4 5 6 7 8 9 : ; < = > ?
@ A B C D E F G H I J K L M N O P Q R S T U V W X Y Z [\] ^ _
` a b c d e f g h i j k l m n o p q r s t u v w x y z { | } ~

BAUDOT Character Set: A B C D E F G H I J K L M N O P Q
R S T U V W X Y Z . ? * 3 # \$ % () , . / 0 1 2 3 4 5 6 7 8 9 : ;
Cursor Modes: Home, Backspace, Horizontal Tab, Line Feed,
Vertical Tab, Carriage Return. Two special cursor sequences
are provided for absolute and relative X-Y cursor addressing •
Cursor Control: Erase, End of Line, Erase of Screen, Form
Feed, Delete • Monitor Operation: 50 or 60Hz (jumper
selectable).

Continental U.S.A. Credit Card Buyers Outside Connecticut

CALL TOLL FREE 800-243-7428

To Order From Connecticut Or For Technical
Assistance, Etc. Call (203) 354-9375

Netronics R&D Ltd., Dept. K-8

333 Litchfield Road, New Milford, CT 06776

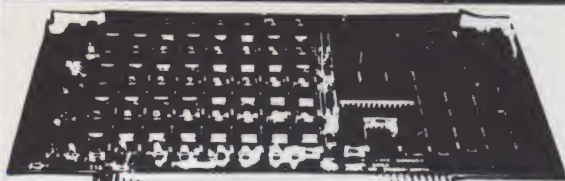
Please send the items checked below—

- ☐ Netronics Stand Alone ASCII Keyboard/Computer
Terminal Kit, \$149.95 plus \$3.00 postage & handling.
- ☐ Deluxe Steel Cabinet for Netronics Keyboard/Termi-
nal In Blue/Black Finish, \$19.95 plus \$2.50 postage
and handling.
- ☐ Video Display Board Kit alone (less keyboard), \$89.95
plus \$3 postage & handling.
- ☐ 12" Video Monitor (10 MHz bandwidth) fully assem-
bled and tested, \$139.95 plus \$5 postage and handling.
- ☐ RF Modulator Kit (to use your TV set for a monitor),
\$8.95 postpaid.
- ☐ 5 amp Power Supply Kit In Deluxe Steel Cabinet
(±8VDC @ 5 amps, plus 6-8 VAC), \$39.95 plus \$2
postage & handling.

Total Enclosed (Conn. res. add sales tax) \$ _____
By—
☐ Personal Check ☐ Cashiers Check/Money Order
☐ Visa ☐ Master Charge (Bank # _____)

Acct. # _____
Signature _____ Exp. Date _____
Print Name _____
Address _____
City _____
State _____ Zip _____

☐ Send Me More Information



32K STATIC RAM S-100 MEMORY BOARD

\$499⁹⁵

ASSEMBLED
& TESTED

FULLY STATIC OPERATION
4K BANK ADDRESSABLE
EXTENDED MEMORY MGMT.
MEETS IEEE PROPOSED
S-100 SIGNAL STANDARDS
4 MHZ OPERATION

California Computer Systems

16K STATIC RAM

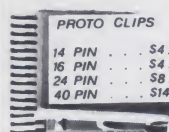


same features
as above.

\$249⁰⁰



IQ120
\$699⁰⁰



PROTO CLIPS
14 PIN . . . \$4.35
16 PIN . . . \$4.50
24 PIN . . . \$8.75
40 PIN . . . \$14.75

80-COLUMN IMPACT PRINTER

LOWEST IN PRICE—HIGHEST IN PERFORMANCE

*Compared Rate
100 Lines per Minute
111200000, 50 or 60 Hz
72, 80, 96, 108 or 120
Character/Line
Self-test Switch
*Auxiliary User Defined Character Set
700, 800, 900, 1000 and Characters
*10 Band Rates to 10,000

\$649⁰⁰

base 2, inc.



CIRCUITS

74LS00	.38
74LS02	.34
74LS03	.34
74LS04	.38
74LS08	.35
74LS09	.38
74LS10	.28
74LS20	.28
74LS21	.38
74LS22	.38
74LS26	.39
74LS27	.36
74LS30	.26
74LS32	.39
74LS38	.39
74LS42	.78
74LS48	.78
74LS51	.25
74LS54	.52
74LS74	.52
74LS75	.65
74LS83	.95
74LS85	1.15
74LS86	.45
74LS90	.70
74LS93	.70
74LS107	.45
74LS112	.48
74LS113	.48
74LS122	.50
74LS123	1.15
74LS126	.86
74LS138	.85
74LS151	.75
74LS153	.75
74LS155	1.15
74LS158	.75
74LS160	.95
74LS161	1.10
74LS162	.95
74LS163	.95
74LS164	1.15
74LS165	.89
74LS170	1.95
74LS174	.90
74LS175	.90
74LS190	1.10
74LS193	.95
74LS195	.95
74LS196	.85
74LS221	1.40
74LS240	2.45

APPLE II Computer with full 48K of memory!

\$1099⁰⁰



APPLE EXPANSION KIT 16K Memory Add-On

\$475⁰⁰

MEMORY ADD-ON KIT
INCLUDES INSTRUCTIONS,
RAMS, AND JUMPERS.
NO TOOLS REQUIRED

Plexiglass cover
as shown

\$24⁹⁵

video 100



\$139⁰⁰

Leedex Corp.

12" BLACK & WHITE
LOW COST VIDEO
MONITOR

8038C

VCO Waveform Gen.
w/sine

\$265

2114L

1024x4 Static RAM
450 ns

\$450

DUST COVERS

APPLE DISK	\$ 3.75
APPLE KEYBOARD	\$ 8.75
TRS-80 KEYBOARD	\$ 7.75
TRS-80 RECORDER	\$ 3.75
TRS-80 SINGLE DISK	\$ 3.75
TRS-80 DOUBLE DISK	\$ 6.75
PET DISK	\$ 7.75
PET TERMINAL/COMP.	\$15.75
NORTHSTAR COMPUTER	\$11.75
SOROC TERMINAL	\$10.75

EPROMS

2708	\$6.75
1Kx8 450NS	
8 FOR \$48.50	
2716	\$18.95
16K(2Kx8) 450NS	
8 FOR \$142.95	
2732	\$39.50
32K (4096x8)	\$58.50

LOGIC PROBE KIT

\$1795

HOME STUDY COURSE ON CASSETTE

Each course below includes a special course book plus two cassettes, for a total course length of 2 1/2 hours. The lecture is completely coordinated to the pages of the book, and cassettes can be played on any standard cassette player.

S1-INTRODUCTION TO MICROPROCESSORS

This seminar is intended for all non-specialists who wish to acquire a broad understanding of the basic concepts and advantages of microprocessors. It explains how microprocessors work, and it stresses methods, costs, advantages and disadvantages for the most important application areas of each type of microprocessor. What is needed to implement a system; how to use it; the impact of microprocessor-based systems; their evolution. Topics covered include: BASIC DEFINITIONS, SYSTEM COMPONENTS, MICROPROCESSOR APPLICATIONS, WHAT TO LOOK FOR, and IMPACT AND EVALUATION.

\$2995

• NO TECHNICAL BACKGROUND ASSUMED •

S2-PROGRAMMING MICROPROCESSORS

This seminar describes the internal operation of a microprocessor system including how instructions are fetched and executed, how programs are written and executed in typical cases (arithmetic and input/output). The goal of this course is to provide an overall understanding of the concepts of microprocessor programming. Requires an understanding of the main concepts in the INTRODUCTION TO MICROPROCESSORS SEMINAR. It is recommended that these two seminars be taken together.

\$2995

TRS-80

16 K Memory Add-On

\$49⁹⁵

KIT
With jumpers and
instructions

CONCORD

COMPUTER COMPONENTS

1971 SOUTH STATE COLLEGE ANAHEIM, CA. 92806

VISA MASTERCHARGE

CHECK OR M.O.

NO C.O.D.

(714) 937-0637

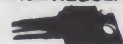
We stock and sell over 12,000 types of semi-conductors

MINIMUM ORDER \$10.00

ADD \$1.50 FOR FRT

CAL RES ADD 6%

VOLTAGE REGULATORS



NEGATIVE	POSITIVE	
7905 (5V)	7805 (5V)	7815 (15V)
7908 (8V)	7808 (8V)	7818 (18V)
7915 (15V)	7808 (8V)	7824 (24V)
7918 (18V)	7812 (12V)	

95¢

new

ULTRAVIOLET INTENSITY METER

by BLAK-RAY



TWO MODELS: LONG WAVE AND SHORT WAVE


Meter consists of a sensor cell attached to a compact (3" x 3 1/4" x 3") metering unit. Can be hand-held or placed directly on surface for measuring. Can be used remotely, while connected to a meter housing by a 4-foot extension cord. Two models available - one for long wave and one for short wave ultraviolet. Readings are in microwatts per square centimeter. Weight: 1 lb.

Completely assembled (includes sensor cell, reduction screen, extension cord, contrast filter and certification report.)

J-221 LONG WAVE
(300nm-400nm) **\$242.00**

J-225 SHORT WAVE
(200nm-280nm) **\$260.00**

CONTINENTAL SPECIALTIES



Proto Clips

14-PIN CLIP	PC-14	.....	\$ 4.50
16-PIN CLIP	PC-16	.....	\$ 4.75
24-PIN CLIP	PC-24	.....	\$10.00
40-PIN CLIP	PC-40	.....	\$16.00




Proto Boards

PB-6	.....	\$17.95
PB-100	.....	19.95
PB-101	.....	22.95
PB-102	.....	25.95
PB-103	.....	44.95
PB-104	.....	55.95
PB-203	.....	99.95
PB-203A	.....	155.00
PB-203A-Kit	.....	131.00

Jumbo 6-Digit Clock Kit

- * Four .50" ht. and two .300" ht. common anode displays
- * Uses MM5314 clock chip
- * Switches for hours, minutes and hold functions
- * Hours easily viewable to 30 feet
- * Simulated walnut case
- * 115 VAC operation
- * 12 or 24 hour operation
- * Includes all components, case and wall transformer
- * Size: 6 1/2" x 3 1/2" x 1 1/2"

JE747 \$29.95



JE701

- * Bright .300 ht. comm. cathode display
- * Uses MM5314 clock chip
- * Switches for hours, minutes and hold modes
- * Hrs. easily viewable to 20 ft.
- * Simulated walnut case
- * 115 VAC operation
- * 12 or 24 hr. operation
- * Incl. all components, case & wall transformer
- * Size: 6 3/4" x 3 1/8" x 1 1/4"

6-Digit Clock Kit \$19.95

Regulated Power Supply

Uses LM309K. Heat sink provided. PC board construction. Provides a solid 1 amp @ 5 volts. Can supply up to +5V, +9V and +12V with JE205 Adapter. Includes components, hardware and instructions. Size: 3 1/2" x 5" x 2 1/4"

JE200 \$14.95



ADAPTER BOARD
—Adapts to JE200—
±5V, ±9V and ±12V

DC/DC converter with +5V input. Toroidal hi-speed switching XMFR. Short circuit protection. PC board construction. Piggy-back to JE 200 board. Size: 3 1/2" x 2" x 9/16" H

JE205 \$12.95

MICROPROCESSOR COMPONENTS

8080A/8088 SUPPORT DEVICES		MICROPROCESSOR MANUALS	
8080A CPU	\$ 7.95	M-280 User Manual	\$7.50
8212 8-Bit Input/Output	3.25	M-CDP1802 User Manual	5.00
8214 Priority Interrupt Control	3.95		
8216 Bi-Directional Bus Driver	3.49	ROM'S	
8224 Clock Generator/Driver	3.95	2513(2140) Character Generator (upper case)	\$9.95
8226 Bus Driver	3.49	2513(3021) Character Generator (lower case)	9.95
8228 System Controller/Bus Driver	4.95	2516 Character Generator	10.95
8238 System Controller	5.95	MMS230N 2048-Bit Read Only Memory	1.95
8251 Prog. Comm. 1/0 (USART)	7.95	RAM'S	
8253 Prog. Interval Timer	14.95	1101 256K1 Static	\$1.49
8255 Prog. Periph. 1/0 (PPI)	9.95	1103 1024X1 Dynamic	.99
8257 Prog. DMA Control	19.95	2101(8101) 256X4 Static	3.95
8259 Prog. Interrupt Control	19.95	2102 1024X1 Static	1.75
		2103 1024X1 Static	1.95
8080/8088 SUPPORT DEVICES		2111(8111) 256X4 Static	3.95
MC6800 MPU with Clock and Ram	\$14.95	2112 256X4 Static MOS	4.95
MC6810A/PI 128KB Static Ram	5.95	2114 1024X4 Static 450ns	7.95
MC6821 Periph. Inter. Adapt (MC6820)	12.95	2114L 1024X4 Static 450ns low power	10.95
MC6828 Priority Interrupt Controller	14.95	2114-3 1024X4 Static 300ns	10.95
MC6830L8 1024KB Bit ROM (MC68A30-8)	7.95	2114L-3 1024X4 Static 300ns low power	11.95
MC6850 Asynchronous Comm. Adapter	9.95	5101 256X4 Static	7.95
MC6852 Synchronous Serial Data Adapt.	12.95	5280/2107 4096K1 Dynamic	4.95
MC6860 0-600 bps Digital MODEM	14.95	7489 16K1 Static	1.75
MC6862 2400 bps Modulator	2.25	748200 256K1 Static Tri-state	4.95
MC6880A Dual 3-State Bus Trans. (MC8276)	49.95	83421 256K1 Static	2.95
MICROPROCESSOR CHIPS—MISCELLANEOUS		UPD414 4K Dynamic 16 pin	4.95
Z80(780C) CPU	\$13.95	UPD416 16K Dynamic 16 pin 250ns	7.95
Z80A(780-1) CPU	2.50	TM54044-4K Static	14.95
CDP1802 CPU	19.95	TM54045 1024X4 Static	14.95
2650 MPU	19.95	2117 16,384K1 Dynamic 350ns	9.95
6502 CPU	11.95	2117 16,384K1 Dynamic	4/1.00
8025 8-Bit MPU w/clock, RAM, 1/0 lines	19.95	PROM'S	
P8085 CPU	19.95	1702A 2048 FAMOS	\$5.95
TMS9900JUL 16-Bit MPU w/hardware, multiply & divide	49.95	2716INT16 18K* EPROM	59.95
SHIFT REGISTERS		TM52516 16K* EPROM	24.95
MM500H Dual 25 Bit Dynamic	50	2716 T.1 16K** EPROM	29.95
MM503H Dual 16 Bit Dynamic	50		
MM504H Dual 16 Bit Static	50	**Requires 3 voltages, -5V, +5V, +12V	
MM505H Dual 100 Bit Static	50	5203 2048 FAMOS	14.95
MM510H Dual 64 Bit Accumulator	89	6301-1(7811) 1024 Tri-state Bipolar	3.49
MM510H 500/512 Bit Dynamic	89	6330-1(7802) 256 Open C Bipolar	2.95
2504T 1024 Dynamic	3.95	68223 32X8 Open Collector	3.95
2518 Hex 32 Bit Static	4.95	682115 4096 Bipolar	19.95
2522 Dual 132 Bit Static	2.95	682123 32X8 Tri-state	3.95
2524 512 Static	99	74186 512 TTL Open Collector	9.95
2525 1024 Dynamic	2.95	74188 256 TTL Open Collector	3.95
2527 Dual 256 Bit Static	2.95	745287 1024 Static	2.95
2528 Dual 250 Static	4.00		
2529 Dual 240 Bit Static	4.00		
2532 Quad 60 Bit Static	2.95		
3341 File	6.95		
74LS670 4K4 Register File (TriState)	2.49		
UART'S			
A-Y-5-1013 30K BAUD	5.95		

Function Generator Kit



Provides 3 basic waveforms: sine, triangle and square wave. Freq. range from 1 Hz to 100K Hz. Output amplitude from 0 volts to over 6 volts (peak to peak). Uses a 12V supply or a ±5V split supply. Includes chip, P.C. Board, components & instructions.

JE2206B \$19.95

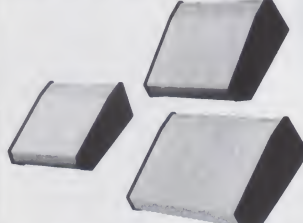
DIGITAL THERMOMETER KIT



*Dual sensors—switching control for indoor/outdoor or dual monitoring
*Continuous LED 8" ht. display
*Range: -40°F to 199°F / -40°C to 100°C
*Accuracy: ±1.1° nominal
*Set for Fahrenheit or Celsius reading
*Sim. walnut case - AC wall adapter incl.
*Size: 3-1/4" H x 6-5/8" W x 1-3/8" D

JE300 \$39.95

DESIGNERS' SERIES Blank Desk-Top Electronic Enclosures



- * High strength epoxy molded and pieces in mocha brown finish.
- * Sliding rear/bottom panel for service and component accessibility.
- * Top/bottom panels .080 thk alum. Alodine type 1200 finish (gold tint color) for best paint adhesion after modification.
- * Vented top and bottom panels for cooling efficiency.
- * Rigid construction provides unlimited applications.

CONSTRUCTION:
The "DTE" Blank Desk Top Electronic Enclosures are designed to blend and complement today's modern computer equipment and can be used in both industrial and home. The end pieces are precision molded with an internal slot (all around) to accept both top and bottom panels. The panels are then fastened to 1/4" thick tabs inside the end pieces to provide maximum rigidity to the enclosure. For ease of equipment servicing, the rear/bottom panel slides back on slotted tracks while the rest of the enclosure remains intact. Different panel widths may be used while maintaining a common profile outline. The molded end pieces can also be painted to match any panel color scheme.

Enclosure Model No.	Panel Width	PRICE
DTE-8	8.00"	\$29.95
DTE-11	10.65"	\$32.95
DTE-14	14.00"	\$34.95

\$10.00 Min. Order — U.S. Funds Only
Calif. Residents Add 6% Sales Tax
Postage — Add 5% plus \$1 Insurance (if desired)
Spec Sheets — 25¢
1980 Catalog Available — Send 41¢ stamp

FREE 1980 CATALOG

Jameco ELECTRONICS

MAIL ORDER ELECTRONICS — WORLDWIDE
1355 SHOREWAY ROAD, BELMONT, CA 94002
PRICES SUBJECT TO CHANGE

PHONE ORDERS WELCOME
(415) 592-8097

The Incredible "Pennywhistle 103"

\$139.95 Kit Only

The Pennywhistle 103 is capable of recording data to and from audio tape without critical speed requirements for the recorder and it is able to communicate directly with another modern and terminal for telephone "handing" and communications. In addition, it is free of critical adjustments and is built with non-precision, readily available parts.

Data Transmission Method Frequency-Shift Keying, full-duplex (half-duplex selectable)
Maximum Data Rate 300 Baud
Data Format Asynchronous Serial (return to mark level required between each character)
Receive Channel Frequencies 2025 Hz for space, 2225 Hz for mark.
Transmit Channel Frequencies Switch selectable. Low (normal) = 1070 space, 1270 mark, high = 025 space, 2225 mark.
Receive Sensitivity -48 dbm acoustically coupled
Transmit Level -15 dbm nominal. Adjustable from -6 dbm to -20 dbm
Receive Frequency Tolerance Frequency reference automatically adjusts to allow for operation between 1800 Hz and 2400 Hz.
Digital Data Interface EIA RS-232C or 20 mA current loop (receiver is optoisolated and non-polar)
Power Requirements 120 VAC, single phase, 10 Watts.
Physical All components mount on a single 5" by 9" printed circuit board. All components included.
Requires a VDM, Audio Oscillator, Frequency Counter and/or Oscilloscope to align.

TRS-80 16K Conversion Kit

Expand your 4K TRS-80 System to 16K.
Kit comes complete with:
* 8 each UPD416-1 (16K Dynamic Rams) 250NS
* Documentation for conversion

TRS-16K \$59.95

JE610 ASCII Encoded Keyboard Kit




The JE610 ASCII Keyboard Kit can be interfaced into most any computer system. The kit comes complete with an industrial grade keyboard switch assembly (62-keys), IC's, sockets, connector, electronic components and a double-sided printed wiring board. The keyboard assembly requires +5V @ 150mA and -12V @ 10mA for operation. Features: 60 keys generate the full 128 characters, upper and lower case ASCII set. Fully buffered. Two user-define keys provided for custom applications. Caps lock for upper-case-only alpha characters. Utilizes a 2376 (40-pin) encoder read-only memory chip. Outputs directly compatible with TTL/DTL or MOS logic arrays. Easy interfacing with a 16-pin dip or 18-pin edge connector.

JE610 (Case not included) \$79.95

Desk-Top Enclosure for JE610 ASCII Encoded Keyboard Kit
Compact desk-top enclosure: Color-coordinated designer's case with light tan aluminum panels and molded end pieces in mocha brown. Includes mounting hardware. Size: 3 3/4" H x 14 1/2" W x 8 3/4" D.

DTE-AK \$49.95
SPECIAL: JE610/DTE-AK PURCHASED TOGETHER (Value \$129.90) **\$124.95**

JE600 Hexadecimal Encoder Kit



FULL 8-BIT LATCHED OUTPUT 19-KEY KEYBOARD

The JE600 Encoder Keyboard Kit provides two separate hexadecimal digits produced from sequential key entries to allow direct programming for 8-bit microprocessor or 8-bit memory circuits. Three additional keys are provided for user operations with one having a bistable output available. The outputs are latched and monitored with 9 LED readouts. Also included is a key entry strobe. Features: Full 8-bit latched output for microprocessor use. Three user-define keys with one being bistable operation. Debounce circuit provided for all 19 keys. 9 LED readouts to verify entries. Easy interfacing with standard 16-pin IC connector. Only +5VDC required for operation.

JE600 (Case not included) \$59.95

Desk-Top Enclosure for JE600 Hexadecimal Keyboard Kit
Compact desk-top enclosure: Color-coordinated designer's case with light tan aluminum panels and molded end pieces in mocha brown. Includes mounting hardware. Size: 3 3/4" H x 8 3/4" W x 8 3/4" D.

DTE-HK \$44.95
SPECIAL: JE600/DTE-HK PURCHASED TOGETHER (Value \$104.90) **\$99.95**

Power Supplies!

Power Supplies!

Power Supplies!

SOLID STATE!! (5)

We got 'em! Take your pick . . .

These units are ideal for micro computers. They have been removed from equipment, checked out and guaranteed.

- 1—5 volts @ 8 amps + 12 volts @ 2 amps + 6 volts @ 75 MA. Power supply has a 3-wire line cord and fused. Dimensions: 10½" x 5½" x 4½". Shipping weight: 16 lbs. 37.50 ea. 2/70.00
- 2—Model 818, 5 volts at 15 amps + 12 volts at 4 amps-12 volts at 2 amps. (with line cord). 35.00 ea. 2/65.00
- 3— + 5 volts at 5 amps ± 12 volts at 500 ma. + 6 volts at 25 ms. (line cord included). 32.95 ea. 2/60.00
- 4—Elaxon, multi output. Input: 120/240 AC, ± 10%, 47-63 hz; output: 1) 12V, 1.5A, DC, OVP; 2) 12V, 1.5A, D.C., OVP. New, in box with operating instructions. 31.50
- 5—Power Design, Model 1210, constant voltage, DC. P.S. input: 105-125 A.C., 55 to 440 hz. Output: 1-12 volts, 0-10 amps, DC. continuously adjustable output voltage and current limiting. 139.00

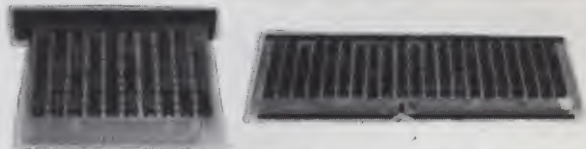
COMPUTER GRADE CAPACITORS . . .

18,000 mfd 10 VDC	1.25	11,000 mfd 25 VDC	1.50	4,000 mfd 75 VDC	1.75
4,400 mfd 20 VDC	1.00	35,000 mfd 35 VDC	3.50	1,000 mfd 100 VDC	1.00
46,000 mfd 20 VDC	2.50	10,000 mfd 50 VDC	2.50	6,800 mfd 100 VDC	3.50
3,000 mfd 25 VDC	1.00	22,000 mfd 60 VDC	3.75	4,700 mfd 150 VDC	3.75

WIRE WRAP BOARDS

These boards are pre-wired and removed from equipment. Easy to un-wrap for setting up your own board, contains mostly 14-pin IC sockets with individual pin connections. Each board has VCC and ground planes.

Smaller board measures 6½" x 6" and has 40 to 50 sockets.
Larger board measures 13½" x 6" and has 75 to 100 sockets.



Reduced prices

\$7.50 ea. 2/\$14.00

\$12.50 ea. 2/\$23.00

DIABLO System Disc Drive

SERIES 40, MODEL 43

100 tracks per inch, total capacity of 50 megabits, w/Model 429 power supply, sector counter, 24 sectors, 1 fixed disc, 1 removable disc, average access time 38 ms, PPM: 2600, dimensions: 10 5/16" high, fits in standard rack, equipped with full extension slides, excellent used condition. Shipped freight collect.



\$2495

HEWLETT PACKARD model 200CD/rack mounted AUDIO OSCILLATOR freq:5hz to 600khz output: 160mw

\$165.00

HEWLETT PACKARD model 400D ANALOG VACUUM TUBE VOLTMETER freq: 10hz to 4mhz voltmeter range: 1mv to 300vac in 12 ranges

\$85.00

TRANSFORMERS

ISOLATION STEP-DOWN TYPE

Primary: 230/115V, 50/60
CPS, Secondary: 115 volts
output 250 VA.

\$13.95

EACH

ROTRON WHISPER FANS

Unused, Model Rotron MU
3A1, 230V, AC, 14 watts,
50/60 hz, guaranteed,
4½" x 4½" x 1½"

\$8.95

Clock Crystal Oscillators—TTL, Vectron, type CO-231T. Crystal freq. 4.9152 mhz. Input voltage 5 VDC ±. Output: Drives 10 TTL Loads Logic "0": 0.4V max., sink 16ma. Logic "1" 2.4V min source 2 ms. (above 50 mhz drives 2 Schottky TTL loads). Tuning adjust. with nominal range of ±30 ppm below 25 mhz and 15 ppm above 25 mhz. R.F.E. 1½" x 1½" x ½" \$13.95

SG-132 SWEEP SIGNAL GENERATOR

FREQ: 15 TO 400 MHz

Output: AM & FM: CW at any frequency. Crystal 5mhz or ± 10B. Frequency accuracy oscilloscope for observing waveforms.

\$329

TRENDLINE PHONES

Manufactured by I.T.T.

These units have rotary dials. Colors are: white, black, red, and green. They are packaged and have 6-foot cord and installation instructions. Used, but in good operating condition.

34.50 WALL TYPE

Minimum order \$25.00. Items offered subject to prior sale. FOB, Brockton, Mass. Money order or check w/order. Shipments and handling add 5%. Shipments by parcel post or UPS. No CODs. Mass. residents add 5% sales tax.

WALLEN

ELECTRONICS CO. INC. Tel: (617) 588-6440-6441
108 SAWTELL AVE., BROCKTON, MA. 02402

ELECTRONIC
COMPONENTS
TEST EQUIPMENT
CONNECTORS—WIRE

WAMECO

THE COMPLETE PC BOARD HOUSE EVERYTHING FOR THE S-100 BUSS

- * **FPB-1** FRONT PANEL BOARD FOR 8080A AND Z80 SYSTEMS IMSAI COMPATIBLE.
PCBD \$54.95 KIT \$165.00
- * **MEM-2** 16K RAM 2114's. ADDRESSABLE IN 4K BOUNDARIES.
PCBD \$31.95 KIT (LESS RAMS) \$80.95
- * **EPM-2** 16/32K ROM USES 2716 OR 2708. ADDRESSABLE IN 4K BOUNDARIES.
PCBD \$31.95 KIT (LESS ROMS) \$74.95
- * **CPU-1** 8080A PROCESSOR BOARD WITH VECTOR INTERRUPT.
PCBD \$31.95 KIT \$124.95
- * **IOB-1** I/O BOARD. ONE SERIAL, TWO PARALLEL WITH CASSETTE. PCBD \$31.95
- * **FDC-1** FLOPPY DISC CONTROLLER BOARD USES 1771. PCBD \$44.95

- * **QMB-12** 13 SLOT MOTHER BOARD.
PCBD \$39.95 KIT \$115.95
- * **QMB-9** 9 SLOT MOTHER BOARD.
PCBD \$34.95 KIT \$89.95
- * **PTB-1** POWER SUPPLY AND TERMINATOR BOARD.
PCBD \$29.95 KIT \$49.95
- * **RTC-1** REAL TIME CLOCK BOARD WITH TWO INTERRUPTS.
PCBD \$27.95 KIT \$79.95
- * **MEM-1** 8K RAM, USES 2102's.
PCBD \$31.95 KIT (LESS RAM) \$71.95
- * **EPM-1** 4K 170Z BOARD.
PCBD \$29.95 KIT (LESS ROM) \$59.95

FUTURE PRODUCTS: 80 CHARACTER VIDEO BOARD.
Z-80 CPU BOARD WITH ROM, 8 PARALLEL PORT I/O BOARD.

**DEALER INQUIRIES INVITED, UNIVERSITY DISCOUNTS AVAILABLE
AT YOUR LOCAL DEALER**

MOST PRODUCTS FOR IMMEDIATE SHIPMENT. NO 4-8 WEEK DELAYS REQUIRED FOR OTHERS.

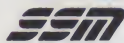
WMC inc.

WAMECO, INC., P. O. BOX 877 • 455 PLAZA ALHAMBRA • EL GRANADA, CA 94018 • (415) 726-6378



CALIFORNIA COMPUTER SYSTEMS

- 16K RAM BOARD.** Fully buffered addressable in 4K blocks. IEEE standard for bank addressing 2114's. PCBD \$27.95 Kit 450 NSEC \$249.95
- PT-1** PROTO BOARD. Over 2,600 holes 4" regulators. All S-100 buss functions labeled, gold fingers. PCBD \$26.95
- PT-2** PROTO BOARD. Similar to PT-1 except set-up to handle solder tail sockets. PCBD \$26.95
- CCS MAIN FRAME.** Kit (S-100) \$339.95
- APPLE EXTENDER.** Kit \$22.95
- APPLE IEEE INSTRUMENTATION INTERFACE** KIT 7490. Kit \$275.00
- ARITHMETIC PROCESSOR FOR APPLE 7811A.** Kit \$350.00
- APPLE ASYNCHRONOUS SERIAL INTERFACE** 7710A. Kit \$89.95
- APPLE SYNCHRONOUS SERIAL INTERFACE** 7712A. Kit \$89.95
- ALL OTHER CCS PRODUCTS AVAILABLE



- PB-1** 2708 & 2716 Programming Board with provisions for 4K or 8K EPROM. No external supplies required. Textool sockets. Kit \$129.95
- CB-1A** 8080 Processor Board. 2K of PROM 256 BYTE RAM power on/rest Vector Jump Parallel port with status. Kit \$129.95 PCBD \$27.95
- VB-3** 80x55 VIDEO BOARD. Graphics included. 2 MHZ \$294.95 4 MHZ \$329.95
- IO-4** Two serial I/O ports with full handshaking 20/60 ma current loop: Two parallel I/O ports. Kit \$130.00 PCBD \$27.95
- VB-1B** 64 x 16 video board, upper lower case Greek composite and parallel video with software, S-100. Kit \$125.00 PCBD \$27.95
- CB-2** Z80 CPU BOARD. Kit \$185.95
- AIO** APPLE SERIAL/PARALLEL \$125.95
- ALL OTHER SSM PRODUCTS AVAILABLE



WAMECO INC.

- FDC-1** FLOPPY CONTROLLER BOARD will drive shugart, pertek, remic 5" & 8" drives up to 8 drives, on board PROM with power boot up, will operate with CPM™ (not included). PCBD \$42.95
- FPB-1** Front Panel. IMSAI size, hex displays. Byte, or instruction single step. PCBD \$47.50
- MEM-1A** 8K x 8 fully buffered, S-100, uses 2102 type rams. PCBD \$25.95
- QM-12** MOTHER BOARD, 13 slot, terminated, S-100 board only \$38.95
- CPU-1** 8080A Processor board S-100 with 8 level vector interrupt. PCBD \$27.95
- RTC-1** Realtime clock board. Two independent interrupts. Software programmable. PCBD \$24.95
- EPM-1** 1702A 4K Eprom card. PCBD \$25.95
- EPM-2** 2708/2716 16K/32K EPROM CARD. PCBD \$25.95
- QM-9** MOTHER BOARD. Short Version of QM-12. 9 Slots. PCBD \$32.95
- MEM-2** 16K x 8 Fully Buffered 2114 Board. PCBD \$27.95
- PTB-1** POWER SUPPLY AND TERMINATOR BOARD. PCBD \$27.95
- IOB-1** SERIAL AND PARALLEL INTERFACE. 2 parallel, one serial and cassette. PCBD \$27.95
- 2708 \$ 9.49 2114L 450 NSEC \$5.99
- 2716 \$35.95 2114L 200 NSEC \$6.99

MIKOS

(415) 726-7593

P. O. Box 955 • El Granada, CA 94018
Please send for IC, Xistor and Computer parts list

AUG. SPECIAL SALE ON PREPAID ORDERS

(Charge cards not included on this offer)

WAMECO BARE PCBD SALE. 10% OFF THE PRICE OF WAMECO PCBD WHEN 5 OR MORE ARE PURCHASED.

MIKOS PARTS ASSORTMENT WITH WAMECO AND CYBERCOM PCBDS

- MEM-2** with MIKOS #7 16K ram with L2114 450 NSEC \$249.95
- MEM-2** with MIKOS #4 13 slot mother with L2114 250 NSEC \$279.95
- CPU-1** with MIKOS #2 8080A CPU \$ 94.95
- QM-12** with MIKOS #5 real time clock board \$ 95.95
- RTC-1** with MIKOS #5 real time clock \$ 59.95
- EMP-1** with MIKOS #10 4K 1702 less EPROMS \$ 49.95
- EPM-2** with MIKOS #11 16-32K EPROMS less EPROMS \$ 59.95
- QM-9** with MIKOS #12 9 slot mother board \$ 89.95
- FPB-1** with MIKOS #14 all parts for front panel \$144.95

MIKOS PARTS ASSORTMENTS ARE ALL FACTORY MARKED PARTS. KITS INCLUDE ALL PARTS LISTED AS REQUIRED FOR THE COMPLETE KIT LESS PARTS LISTED. ALL SOCKETS INCLUDED.

LARGE SELECTION OF LS TTL AVAILABLE

VISA or MASTERCARD. Send account number, interbank number, expiration date and sign your order. Approx. postage will be added. Check or money order will be sent post paid in U.S. If you are not a regular customer, please use charge, cashier's check or postal money order. Otherwise there will be a two-week delay for checks to clear. Calif. residents add 6% tax. Money back 30-day guarantee. We cannot accept returned IC's that have been soldered to. Prices subject to change without notice. \$10 minimum order. \$1.50 service charge on orders less than \$10.00.

CompuPro™ from

GODBOUT
ELECTRONICS

MEET THE ECONORAM FAMILY.....
all ECONORAMS from COMPUKIT include:

- Fully static memory used throughout to promote reliable operation and facilitate direct memory access (DMA)
- 4 MHz with Z80 - 5 MHz with 8085
- Buffered tri-state outputs and buffered inputs.
- All lines buffered; address and data lines buffered to 1 low power Schottky TTL load, all other lines buffered to less than 1 TTL load.
- Onboard regulation.
- DIP switch address selection and deselection (no wire jumpers).
- Low power Schottky support ICs.
- S-100 boards have WRITE strobe selections switch - allows use of memory with or without front panel.

Most ECONORAMS come in 3 forms, UNKIT (UKT) - (this means that all sockets, disc capacitors are already soldered in place for easy assembly), fully assembled & tested (A&T), or qualified under the Certified System Component (CSC) high-reliability program (200 hour burn-in, guaranteed 4MHz operation over full temperature range, serial numbered, immediate replacement in event of failure with 1 year of invoice date).

- All ICs are socketed (including support chips)
- Unique multi-block configurations for addressing flexibility.
- Industry standard board sizes.
- High quality, double sided, plate through, solder-masked and legended circuit board.
- LOW current consumption and guaranteed specs.
- 1 year limited warranty (not just 90 days).

SALE

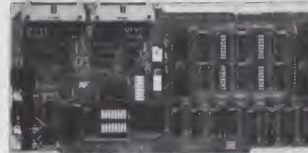
SALE



NEW
8K
ECONORAM
IIA

We realize that this may not look like the 8K. Econoram II board you've known and loved for so many years, however, at Godbout, good things don't come to an end - they just get better! Our NEW 8K Econoram IIA board retains all the best selling features of the old Econoram II PLUS is now 4 MHz STANDARD - still static - with **ultra** low power consumption. S-100 compatible. Single supply required - guaranteed maximum current under 900mA. Typical boards draw 700 to 800mA. Phantom feature is included on the new Econoram IIA and is switch selectable. Organized as two 4K independently addressable blocks. Includes switched WRITE protect - block and board disable. Also, has provision for memory management. Shipping Weight 2 lbs.

	Reg.	Sale
GBT - ECONORAM IIA UKT	\$169.00	\$159.00
GBT - ECONORAM IIA A&T	\$189.00	\$169.00



CK022 S-100
INTERFACER

Our new I/O board gives you unparalleled flexibility and operating convenience. We include such features as:

- 2 independently addressable serial ports (dip switch selectable addresses)
- Real LSI hardware UARTs for minimum CPU housekeeping
- RS232C, current loop (20mA), & TTL signals on both ports
- Precision, crystal-controlled Baud rates up to 19.2K Baud (individually dip switch selectable)
- Transmit & receive interrupts on both channels, jumperable to any vectored interrupt line
- Industry standard RS232 level converters with five RS232 handshaking lines per port
- Optically isolated, current loop with provisions for both on-board & off-board current sources
- UART parameters, interrupt enables & RS232 handshaking lines are software programmable with power-on hardware default to customer specified hard-wired settings for maximum flexibility
- Port connectors mate directly to ribbon cable & DB25 connectors in standard pinouts
- RS232 lines will conform to either master or slave configurations
- Board gives full feature operation with both 2 & 4 MHz systems
- Low power consumption, +8V @ 450mA, +16V @ 150mA, -16V @ 70mA max.
- No software initialization required for board operation, although board parameters may be altered by software 2 lbs.

	Reg.	Sale
GBT - INTERFACER I UKT	\$199.00	\$189.00
GBT - INTERFACER I A&T	\$249.00	\$219.00

NEW! 32K X 8 ECONORAM X
Static storage for the S-100 buss.

Static storage for the S-100 buss. Guaranteed 4 MHz operation. Configured as two 8K and one 16K block, all independently addressable, protectable & enableable. Suitable for use in phantom systems. Extra select/deselect qualifiers for systems using more than 64K of memory make this board the ideal building block for large memory systems. Maybe you can't believe the low pricing - but you can count on the Econoram performance! Also available populated to 16K. Shipping Weight 2 lbs.

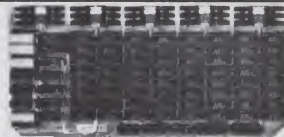
	Reg.	Sale
GBT - ECONORAM X 16K UKT	\$329.00	\$308.00
GBT - ECONORAM X 16K A&T	\$379.00	\$319.00
GBT - ECONORAM X 32K UKT	\$599.00	\$559.00
GBT - ECONORAM X 32K A&T	\$689.00	\$589.00

INTERFACER II

The new Interfacier II I/O board incorporates one channel of serial I/O with all the features of the INTERFACER dual RS232 serial board, plus 3 full duplex Parallel ports. The serial section includes all the features you've come to expect - a hardware UART, on-board crystal controlled Baud rate generator, hardware/software programmability, RS232 handshaking lines with real RS232 drivers, current loop & TTL drivers, full interrupts and more!!! The parallel selection utilizes LSTTL octal latches for latched input & output data with 24mA drive current, attention, enable & strobe bits for each parallel port (each with selectable polarity), interrupts for each input port, separate 25 pin connectors with power for each channel and a status port for interrupt mask and port status. All in all - an incredibly flexible and easy to use board.

	Reg.	Sale
GBT - INTERFACER II UKT	\$199.00	\$189.00
GBT - INTERFACER II A&T	\$249.00	\$219.00

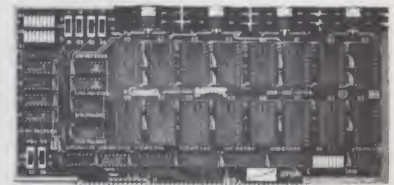
ECONORAM
XIIIA-32



32K BANK SELECT! S-100 compatible. 4MHz guaranteed operation (0-70 C). Features two 16K blocks independently addressable on 16K boundaries. Two independent banks - individual phantom - 256 ports DIP switch selectable - each block may be deselected with a single switch. Perfect for use in Alpha Micro Systems, Marinchip & others. Uses 4K x 1 low power STATIC rams. Current consumption guaranteed 3500mA max. Shipping Weight 2 lbs.

	Reg.	Sale
GBT - ECONORAM XIIIA 16K UKT	\$349.00	\$329.00
GBT - ECONORAM XIIIA 16K A&T	\$419.00	\$369.00
GBT - ECONORAM XIIIA 24K UKT	\$479.00	\$449.00
GBT - ECONORAM XIIIA 24K A&T	\$539.00	\$479.00
GBT - ECONORAM XIIIA 32K UKT	\$649.00	\$598.00
GBT - ECONORAM XIIIA 32K A&T	\$729.00	\$649.00

ECONOROM
2708



Has provisions for wait states for 4MHz operations. Configured as four 4K blocks - each independently addressable and disableable. Power-on jump. Does **NOT** include 2708s. Includes all support chips, sockets, regulators, heat sinks, etc. Sold in UNKIT form only. Shipping Weight 2 lbs.

GBT - ECONOROM 2708 UKT	\$85.00
-------------------------------	---------

NEW	NEW			NEW	NEW
GBT-SPECTRUM (Color graphics) KIT.	339.00	319.00	GBT-CPU-Z80 A&T.....	295.00	269.00
GBT-SPECTRUM (Color graphics) A&T.	399.00	349.00	GBT-CPU-8085 KIT.....	235.00	220.00
GBT-CPU-Z80 KIT.....	225.00	210.00	GBT-CPU-8085 A&T.....	325.00	259.00
			GBT-CPU-8085/8088 KIT.....	385.00	365.00
				</	

ECONORAM XIV

16K x 8 for S-100. Addressable on any 4K boundary. Direct addressing on up to 24 address lines. Fully meets IEEE S-100 buss. specs. Low power, hi speed static memory. Operates up to 5MHz with newest 8085/8086/8088 CPUs. Can be used with 8080, Z80, 8085, 8086, 8088, Z8000, etc.

	Reg.	Sale		Reg.	Sale
GBT - ECONORAM XIV UKT	\$299.00	\$279.00	GBT - ECONORAM XIV A&T	\$349.00	\$298.00

PRIORITY ONE ELECTRONICS

CENTRONICS 730 Dot Matrix Printer

STANDARD FEATURES: • 50 Characters/second • Characters/line • 10 characters/inch • 3 way paper handling system • 7 x 7 dot matrix • 96 character ASCII • microprocessor electronics • unidirectional print at 50 ips • high speed return approximately 10 ips • 21 lpm with 80 columns printed • 58 lpm with 20 columns printed • 80 character buffer • 6 ips vertical • Centronics Colors and logo

FORMS HANDLING: Roll Paper 8.5 in. x 5.0 dia. with 1 in. core maximum dimension 3.5 in. wide with 38 in. core minimum dimension Fan Gold 9.0 in. x 22.9 cm wide pin to pin 9.5 in. x 24 cm wide overall Up to 3 ply paper with 2 carbons (total thickness not to exceed .012 inches) Cut Sheet Maximum width 8.5 inches

RIBBON SYSTEM: Continuous ribbon 9/16 (14mm) wide 20 yards (18.3 meters) long Microbus Loop allows printing on upper and lower portion on alternate passes

OPERATOR CONTROLS: Power on/off Reset Switch allows disabling of printer without dropping AC

DATA INPUT: 7 or 8 bit ASCII parallel TTL levels with strobe Acknowledge pulse indicates that data was received

PHYSICAL DIMENSIONS: Weight less than 10 lbs 5 kg Width 14.5 inches 37 cm Depth 11.0 inches 28 cm Height 4.89 inches 13 cm Dimensions exclusive of roll paper holder

SHIPPING WEIGHT: 14 lbs

CEN-730-1 (Parallel Int.) LIST PRICE: \$795.00

SAVE \$100.00

WOW
PRICE
\$695.00
WOW



TRS-80/APPLE MEMORY EXPANSION KITS

4116's RAMS
from Leading Manufacturers
(16Kx1 200/250ns) **SETS SOLD** 1,000's

100% GUARANTEED

8 for \$50.00
ADD \$3.00 FOR PROGRAMMING JUMPERS
FOR TRS-80 KEYBOARD

4116's 100 pcs & UP \$5.20 each
1000 pcs & UP \$4.45 each

The STAR modem from Livermore



LIST PRICE
\$199.00

OUR CORNER
THE MARKET PRICE
\$139.00

FEATURE
FITS GTE HANDSETS!

The STAR modem from Livermore represents a significant breakthrough in the development of acoustic modems. The small, lightweight case houses a high-performance modem that competes with the highest quality standard-sized couplers available. Yet, because of its cost effective design, the STAR has become the price/performance leader in the industry.

CIRCUITRY:
The switchable, four-section bandpass filter provides the user with excellent out-of-band rejection to assure accurate processing of the received carrier, even at signal levels of less than -47 dBm. Further, the proven soft limiter and phase lock loop discriminator yields data that is essentially jitter free.

The oscillator is built using highly stable, state-variable circuitry that delivers a nearly harmonic free, phase coherent sine wave to the telephone network, assuring compatibility with all other 103 type modems. Because of the pureness of the sine wave,

the STAR modem exceeds even the stringent harmonic requirements of all CCITT countries.

CARRIER DETECT

To assure accurate teleprocessing connections, the carrier detect circuitry prevents the modem from attempting to operate when excessive noise would produce errors or cause marginal operation. The circuitry also has a special amplitude sensor that prevents chatter when the received signal fades.

EXCLUSIVE ACOUSTIC CHAMBERS

The exclusive triple seal of Livermore's new flat mounted cups locks the handset into the acoustic chamber yielding superior acoustic isolation and mechanical cushioning. Designed to adapt to most common handsets used throughout the world, the STAR offers the utmost in flexibility and transmission reliability.

SELF TEST

The self test feature on the STAR allows the user to verify total operation of the acoustic modem by using the terminal in the full duplex mode. No need for remote

assistance in diagnosing terminal or modem problems.

Utilizing the experience gained from building high quality couplers for over twelve years, Livermore has designed a coupler superior to any in its class for cost efficiency in industrial, commercial, business or home situations. You can see why we call it the STAR!

DATA RATE, 0 to 300 baud

Compatibility: Bell 103 and 113, CCITT

Transmit Frequencies: Originate - 1070 Hz/Space, 1270 Hz/Mark Answer 2025 Hz/Space, 2225 Hz/Mark

Receive Frequencies: Originate - 2025 Hz/Space, 2225 Hz/Mark Answer 1070 Hz/Space, 1270 Hz/Mark

Frequency Stability: ± 0.3 percent

Receiver Sensitivity: -50 dBm ON -53 dBm OFF

Transmit Level: -15 dBm

Modulation: Frequency shift keyed (FSK)

Carrier Detect Delay: 1.2 seconds ON; 120 msec OFF

EIA Terminal Interface: Compatible with RS 232 specifications

Teletype Interface: 20 milliampere current loop

Optional Interfaces: IEEE 488, TTL, TTY 43

*International (CCITT) frequencies available

Switches: Originate/Off/Answer: Full Duplex/Test/Half Duplex

Indicators: Transmit Data, Receive Data, Carrier Ready, Test

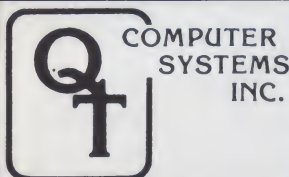
Environmental: Ambient operating temperature 5°C to 50°C. Relative humidity 10 to 90 percent (non-condensing)

Power: Supplied by 24 VAC/150 MA UL/CSA listed wall-mount transformer. Input 115 VAC, 2.5 watts (A 220 VAC, 50 Hz adaptor is available upon request)

Dimensions: 10" x 4" x 2"

Weight: 1.75 lbs (2.2 lbs shipping weight including AC adaptor)

Warranty: Two years on parts and labor, excluding the AC adaptor which carries the manufacturer's warranty.



COMPUTER
SYSTEMS
INC.

**IEEE S-100
COMPATIBLE**

EXPANDABLE + DYNAMIC MEMORY (16K to 64K)

- + Works With Cromenco Systems
- + Uses 3242 Refresh Chip
- + 4 Layers Mean A Quiet Board

- + Bank Selectable Write Protect
- + Phantom Output Disable
- + Switch Selectable Output Disable

Bare Board \$ 49.95
16K Kit \$295.95
16K A&T \$345.95

32K Kit \$369.95
32K A&T \$419.95
48K Kit \$444.95

48K A&T \$494.95
64K Kit \$519.95
64K A&T \$569.95

Z+ 80 CPU

- + 1K Ram On Board + 2 Programmable Timers
- + Switch Selectable 2 or 4 MHz
- + Power On Jump to On-Board 1K or 2K EPROM (2708-2716-2732) Can be Addressed on any 1K, 2K or 4K Boundary

Bare Board \$ 45.00
Kit \$169.95

A&T \$229.95
1K Memory Kit \$ 12.00

CLOCK CALENDAR +

- + Time of Day in Hours, Minutes and Seconds
- + 24 Hour Time Format
- + Month and Day Date Function

Bare Board \$45.00 Kit \$99.95 A&T \$149.95

- + Simple Read Instructions Allow Simple Interface to Basic, CPM, Etc.
- + Will Run With 4 MHz Processors
- + Can be Located at any Group of 4 I/O Port Addressed

LOBO 8" DISK DRIVE CABINET



New from Lobo, a dual Cabinet with power supply, and internal data cable hook-up

- Cabinet accepts 2 801R, 800R, FD120, or FD200 style disk drives
- Power Supply for 2 drives
- Assembled, tested and guaranteed by Lobo Drives
- Shipping Weight 30 lbs.

LBO - DUAL 8 PCS. \$329.00

BUY CABINET AND DRIVES AND SAVE

WITH 1 DRIVE WITH 2 DRIVES
LBO-801R-1PSC \$177.50 LBO-801R-2PSC \$1250.00

DISC DRIVE ONLY

SHU-801R.....\$499.00

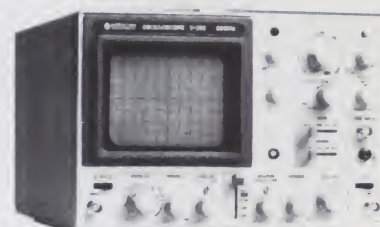
EXTERNAL DATA CABLES

CARDEDGE TO CARDEGE CARDEDGE TO SOCKET
PRI-50CE-CE \$119.95 PRI-50CE-SKT \$119.95

MEMORY HEADQUARTERS

2716 16K 5 Volt only EPROM. . \$2200 ea.
10/20000
2708 8K 450ns EPROM. 8/\$5500
\$850 ea.
2114-3L 1Kx4 300ns Low Power. 8 \$4500
100 + \$450 ea.
5257-3L 4Kx1 300ns Low Power. . 8/\$5500
100 + \$525 ea.
2102AL-2 L/P 250ns in lots of 20. 1.25 ea.
100 + 1.10 ea.

Hitachi V302



30MHZ DUAL TRACE OSCILLOSCOPE

LIST 945.00 - SALE \$79800

- TV sync-separator circuit
- High-sensitivity 1mV/div
- Sweep-time magnifier (5MHz) (10 times)
- Z-axis input (intensity modulation)
- Signal delay line
- X-Y operation
- Trace Rotation
- Complete with 2 probes
- CH1, CH2, DUAL, ADD, DIFF, Vertical Deflection Modes
- V152 Dual Trace 15MHz - no delay sweep

LIST 695.00

SALE \$59500

FOR MORE INFORMATION SEE OUR 52 PAGE AD IN JANUARY BYTE OR SEND \$1.00 FOR CATALOG

• Sale Prices are for prepaid orders only • Quantities are limited, subject to prior sale • CREDIT CARD ORDERS WILL BE CHARGED APPROPRIATE FREIGHT

PRIORITY ONE ELECTRONICS

16723K Roscoe Blvd. Sepulveda, CA 91343

Terms: Visa, MC, BAC, Check, Money Order, U.S. Funds Only. CA residents add 6% sales tax. Minimum order \$10.00 Prepaid U.S. orders less than \$75.00 include 5% shipping and handling. MINIMUM \$2.50. Excess refunded. Just in case ... please include your phone no. Prices subject to change without notice. We will do our best to maintain prices thru Aug 1980.

* SOCKET AND CONNECTOR prices based on GOLD, not exceeding \$500 per oz.

* Sale Prices are for prepaid orders only credit card orders will be charged appropriate freight

ORDER TOLL FREE
1-800-423-5633
except CA., AK., HI., CALL
(213) 894-8171

SEND \$1.00 FOR 52 PAGE CATALOG

SEND \$1.00 FOR 52 PAGE CATALOG

ORDER TOLL FREE (800) 423-5633

DIGITAL RESEARCH COMPUTERS

(214) 271-3538

32K S-100 EPROM CARD

NEW!

\$74.95
KIT

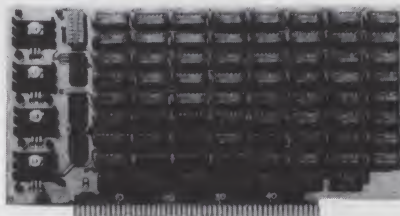
USES 2716's
Blank PC Board - \$34
ASSEMBLED & TESTED
ADD \$30

SPECIAL: 2716 EPROM's (450 NS) Are \$19.95 EA. With Above Kit

KIT FEATURES:

1. Uses +5V only 2716 (2Kx8) EPROM's.
2. Allows up to 32K of software on line!
3. IEEE S-100 Compatible.
4. Addressable as two independent 16K blocks.
5. Cromemco extended or Northstar bank select.
6. On board wait state circuitry if needed.
7. Any or all EPROM locations can be disabled.
8. Double sided PC board, solder-masked, silk-screened.
9. Gold plated contact fingers.
10. Unselected EPROM's automatically powered down for low power.
11. Fully buffered and bypassed.
12. Easy and quick to assemble.

8K LOW POWER RAM KIT-S 100 BUSS



21L02
(450 NS RAMS!)

\$119.50
KIT

ASSEMBLED & FULLY
BURNED IN ADD \$35

Thousands of computer systems rely on this rugged, work horse, RAM board. Designed for error-free, NO HASSLE, systems use

Blank PC Board w/Documentation - \$29.95

Low Profile Socket Set - \$13.50

Support IC's (TTL & Regulators) - \$9.75

Bypass CAP's (Disc & Tantalums) - \$4.50

ADD \$10
FOR 4 MHZ

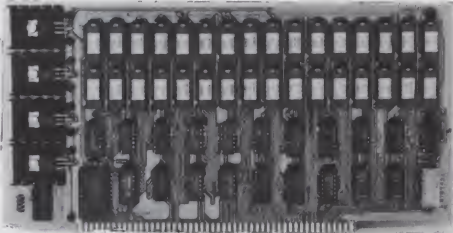
SALE! LOW POWER - 300NS 2114 RAM SALE! 8 FOR \$44
4K STATIC RAM'S. MAJOR BRAND, NEW PARTS.
These are the most sought after 2114's, LOW POWER and 300NS FAST.
8 FOR \$44

16K STATIC RAM KIT-S 100 BUSS

PRICE CUT!

\$225 KIT

FOR 4MHZ
ADD \$10



KIT FEATURES:

1. Addressable as four separate 4K Blocks.
2. ON BOARD BANK SELECT circuitry. (Cromemco Standard!). Allows up to 512K on line!
3. Uses 2114 (450NS) 4K Static Rams.
4. ON BOARD SELECTABLE WAIT STATES.
5. Double sided PC Board, with solder mask and silk screened layout. Gold plated contact fingers.
6. All address and data lines fully buffered.
7. Kit includes ALL parts and sockets.
8. PHANTOM is jumpered to PIN 67.
9. LOW POWER: under 1.5 amps TYPICAL from the +8 Volt Buss.
10. Blank PC Board can be populated as any multiple of 4K.

BLANK PC BOARD W/DATA-\$33
LOW PROFILE SOCKET SET-\$12
SUPPORT IC'S & CAPS-\$19.95
ASSEMBLED & TESTED-ADD \$35

**OUR #1 SELLING
RAM BOARD!**

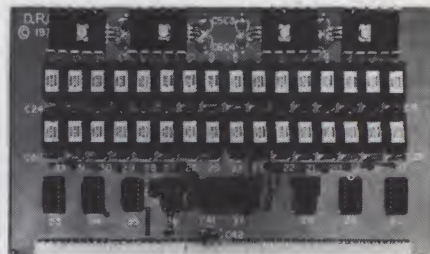
16K STATIC RAM SS-50 BUSS

PRICE CUT!

\$229 KIT

FULLY STATIC!

FOR 2MHZ
ADD \$10



**FOR SWTPC
6800 BUSS!**

ASSEMBLED AND
TESTED - \$35

KIT FEATURES:

1. Addressable on 16K Boundaries
2. Uses 2114 Static Ram
3. Fully Bypassed
4. Double sided PC Board. Solder mask and silk screened layout.
5. All Parts and Sockets included
6. Low Power: Under 1.5 Amps Typical

BLANK PC BOARD-\$26 COMPLETE SOCKET SET-\$12
SUPPORT IC'S AND CAPS-\$19.95

NEW! S-100 SOUND COMPUTER BOARD NEW!

At last, an S-100 Board that unleashes the full power of two unbelievable General Instruments AY3-9910 NMOS computer sound IC's. Allows you under total computer control to generate an infinite number of special sound effects for games or any other program. Sounds can be called in BASIC, ASSEMBLY LANGUAGE, etc.

KIT FEATURES:

- * TWO GI SOUND COMPUTER IC'S.
 - * FOUR PARALLEL I/O PORTS ON BOARD.
 - * USES ON BOARD AUDIO AMPS OR YOUR STEREO.
 - * ON BOARD PROTO TYPING AREA.
 - * ALL SOCKETS, PARTS AND HARDWARE ARE INCLUDED.
 - * PC BOARD IS SOLDERMASKED, SILK SCREENED, WITH GOLD CONTACTS.
 - * EASY, QUICK, AND FUN TO BUILD. WITH FULL INSTRUCTIONS.
 - * USES PROGRAMMED I/O FOR MAXIMUM SYSTEM FLEXIBILITY.
- Both Basic and Assembly Language Programming examples are included.

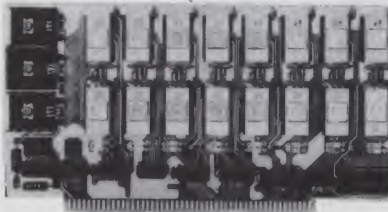
SOFTWARE:

SCL™ is now available! Our Sound Command Language makes writing Sound Effects programs a SNAP! SCL™ also includes routines for Register-Examine-Modify, Memory-Examine-Modify, and Play-Memory. SCL™ is available on CP/M* compatible diskette of 2708 or 2716. Diskette - \$24.95 2708 - \$19.95 2716 - \$29.95 Diskette includes the source. EPROM'S are ORG at E000H.

COMPLETE KIT!
\$84.95
(WITH DATA MANUAL)

BLANK PC
BOARD W/DATA
\$31

16K EPROM CARD-S 100 BUSS



\$59.95
KIT

BLANK PC BOARD - \$28

USES 2708's!

Thousands of personal and business systems around the world use this board with complete satisfaction. Puts 16K of software on line at ALL TIMES! Kit features a top quality soldermasked and silk-screened PC board and first run parts and sockets. Any number of EPROM locations may be disabled to avoid any memory conflicts. Fully buffered and has WAIT STATE capabilities.

ASSEMBLED AND FULLY
TESTED — ADD \$30

OUR 450 NS 2708'S
ARE \$8.95 EA. WITH
PURCHASE OF KIT

RCA CMOS COMPUTER CHIP SET

INCLUDES:

- | | |
|-------------------------|------------------------|
| 1-CDP1802CD CPU | 1-CDP1861CD VIDEO IC |
| 2-CDP1822CE 256 x 4 RAM | 1-CDP1862CE COLOR GEN. |
| 1-CDP1858CE 4 BIT LATCH | 1-CDP1863CE SOUND GEN. |

COMPLETE SET \$45 LIMITED QTY

NEW! G.I. COMPUTER SOUND CHIP

AY3-9910. As featured in July, 1979 BYTE! A fantastically powerful Sound & Music Generator. Perfect for use with any 8 Bit Microprocessor. Contains: 3 Tone Channels, Noise Generator, 3 Channels of Amplitude Control. 16 bit Envelope Period Control, 2-8 Bit Parallel I/O. 3 D to A Converters, plus much more! All in one 40 Pin DIP. Super easy interface to the S-100 or other busses.

SPECIAL OFFER: \$14.95 each Add \$3 for 60 page Data Manual.

TERMS: Add \$1.00 postage, we pay balance. Orders under \$15 add 75¢ handling. No C.O.D. We accept Visa and MasterCard. Tex. Res. add 5% Tax. Foreign orders (except Canada) add 20% P & H. 90 Day Money Back Guarantee on all items. Orders over \$50. add 85¢ for insurance.

Digital Research Computers
(OF TEXAS)
P.O. BOX 401565 • GARLAND, TEXAS 75040 • (214) 271-3538

*TRADEMARK OF DIGITAL RESEARCH.

NOT ASSOCIATED WITH DIGITAL RESEARCH OF CALIFORNIA, THE SUPPLIERS OF CPM SOFTWARE.

Expand your Horizon...

or any S-100 System to Double or Quad Density Mini Floppies

Double Density Controller Boards

Kit, List \$399. NOR-33011-K **OUR PRICE \$329**

Assembled and Tested, List \$499... NOR-33010-A **\$399**

Since its introduction, the North Star Double Density Controller Board has been an item virtually impossible to obtain (except in a double density Horizon). We now have — for immediate delivery — complete double density (or quad density) disk systems OR double density controller boards only. Double density controllers work with up to 4 double or quad density drives; single, double, and quad density drives can be mixed.

Add \$2.50 for shipping and insurance.

NOTE: North Star Double Density Controllers may perform satisfactory with older Shugart SA-400 single density drives; however, North Star does not recommend or guarantee such combinations. MiniMicroMart strongly recommends the purchase of a new double density Shugart SA-400, double density MPI-51 or quad density (double sided) MPI-52.

Fantastic Savings on a "Quad" Density Upgrade for Horizon

North Star Double Density Controller Board (see above) and a quad density (double sided, double density) MPI-52 Mini Floppy Disk Drive (features superior door and disk handling mechanism).

MDS-H-MQ/K, Kit form

List \$999

Order NOR-33011-Q

OUR PRICE \$699

MDS-H-MQ/A Assembled form, List \$1099... NOR-33012-Q **\$759**
Shipping and Insurance: Add \$6

Above prices for converting existing Horizon 1 to quad.

For Horizon 2, order additional MPI-52

MPI-52... **\$379**

Shipping and Insurance: Add \$6

Save up to 25% on North Star Memory Boards

16K Dynamic RAM (RAM-16A/K)

Kit, List \$399

Order NOR-32017-K

SPECIAL \$299

Assembled (RAM-16-A/A), List \$499... NOR-32016-A **\$420**

32K (RAM-32-A/K)

Kit, List \$669, Order NOR-32033-K

ONLY \$499

Assembled (RAM-32-A/A), List \$739... NOR-32032-A **\$620**

Shipping and Insurance: Add \$2.50.

North Star Controllers and Disk Systems include latest version DOS, and BASIC.

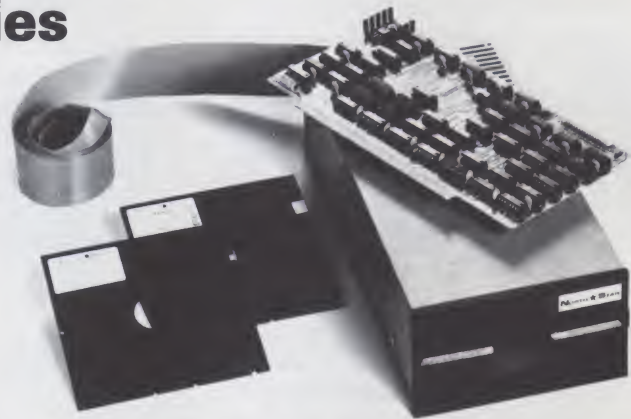
Above prices reflect a 2% cash discount (order prepaid prior to shipment). Add 2% to prices for credit card orders, C.O.D.'s, etc. Prices are subject to change and offers subject to withdrawal without notice. **WRITE FOR FREE CATALOG.**

MiniMicroMart, Inc.

✓ 226 1618 James Street, Syracuse, NY 13203 (315) 422-4467

TWX 710-541-0431

✓ Reader Service Index—page 241



North Star MDS-A DD Mini Floppy Disk System

In Stock — First Time in 2 Years!

Double Density, Kit, List \$799

OUR PRICE \$669

Assembled and Tested, List \$899... NOR-40000-A **\$719**

Quad Version, Kit, List \$999... NOR-40003-K **\$836**

Assembled, List \$1099... NOR-40002-A **\$896**

Above MDS-A units do not include cabinet or power supply.

Shipping and Insurance: Add \$7.50

Cabinet, blue finish... **\$29**

Dual Cabinet (holds 2 drives)... **\$49**

Super Special!

North Star Controller Board, Drive, Cabinet and Power Supply **\$709**

Complete system similar to above but also includes a cabinet and an assembled/tested power supply for the drive (silver finish). Your choice of Shugart SA-400 or MPI-51 Double Density Drive or MPI-52 Quad Density Drive (MPI drives feature improved door and disk handling mechanism).

NOR-40001-L w/Controller Board in kit form and SA-400... **\$709**

NOR-40001-M w/Controller Board in kit form and MPI-51... **\$709**

NOR-40003-N w/Controller Board in kit form and MPI-52... **\$809**

NOR-40000-L with Assembled Board and SA-400... **\$769**

NOR-40000-M with Assembled Board and MPI-51... **\$769**

NOR-40002-N with Assembled Board and MPI-52... **\$869**

Shipping and Insurance: Add \$6.



Terminals and Printers!

TELEVIDEO TVI-912C



Upper and lower case, 15 baud rates: 75 to 19,000 baud, dual intensity, 24 x 80 character display, 12 x 10 resolution. Numeric pad. Programmable reversible video, auxiliary port, self-test mode, protect mode, block mode, tabbing, addressable cursor. Microprocessor controlled, programmable underline, line and character insert/delete. "C" version features typewriter-style keyboard. List \$950

OUR PRICE \$789

920C (with 11 function keys, 6 edit keys and 2 transmission mode keys, List \$1030
ONLY \$849

Intertec EMULATOR

Software compatible with a Soroc IQ-120, Hazeltine 1500, ADM-3A or DEC VT-52. Features block mode transmission and printer port; 12" anti-glare screen; 18-key numeric keypad; full cursor control. List \$895

OUR PRICE \$729



Intertec INTERTUBE II

List \$995 **ONLY \$799**

12" display, 24 x 80 format, 18-key numeric keypad, 128 upper/lower case ASCII characters. Reverse video, blinking, complete cursor addressing and control. Special user-defined control function keys, protected and unprotected fields. Line insert/delete and character insert/delete editing, eleven special line drawing symbols.

SOROC



IQ-120
List \$995
SPECIAL \$729

IQ-140 List \$1495
SPECIAL \$1149

HAZELTINE

1500

ONLY \$879



1410 w/numeric keypad, List \$900 \$749
1420 w/lower case and numeric pad 849
1510, List \$1395 1089
1520, List \$1650 1389

BANTAM 550

From Perkin-Elmer



ONLY \$799
with
anti-glare
CRT
ONLY \$829

CENTRONICS PRINTERS

NEW 730, parallel, friction, tractor ... **\$679**
NEW 737 parallel, friction, tractor **\$849**
779-2 w/tractor (same as TRS-80 Line
Printer I), List \$1350 1049
702 120 cps, bi-direct., tractor, VFU 1995
703 185 cps, bi-direct., tractor, VFU 2395
704 RS232 serial version of 703, \$2350 .. **\$1995**

Above prices reflect a 2% cash discount (order prepaid prior to shipment). Add 2% to prices for credit card orders, C.O.D.'s, etc. Prices are f.o.b. shipping point. Prices are subject to change and offers subject to withdrawal without notice. **WRITE FOR FREE CATALOG.**

TI-810



TI-810 Basic Unit, \$1895 . **ONLY \$1695**
TI-810 w/full ASCII (Lower case), vertical
forms control, and compressed print . **\$1895**
TI-745 Complete printing terminal
with acoustic coupler, List \$1695 **\$1399**

PAPER TIGER®



IDS-440 Paper Tiger, List \$995 . **\$895**
w/graphics option, incl. buffer, \$1194 .. **\$989**
TRS-80 cable 45

NEC SPINWRITER™



Terminal/Keyboard as well as
RO Printer Only models available.
CALL FOR PRICES!

OKIDATA Microline 80

ONLY \$649

Tractor Feed Option \$99
Serial interface \$89

AXIOM IMP I **\$699**

COMPRINT 912 w/parallel interf. **\$559**
912 w/serial interface, List \$699 **\$589**

MICROTEK, List \$750 **\$675**

ANADEx 80-Col. Dot Matrix **\$849**

MiniMicroMart, Inc.

1618 James Street, Syracuse NY 13203 (315) 422-4467 TWX 710-541-0431



MICROCOMPUTING T.M. LIST OF ADVERTISERS

R.S. Number	Page	R.S. Number	Page	R.S. Number	Page
178	AAA Chicago Computer Center.....203	254	Erickson Communications.....220	482	Mullen Computer Products.....15
91	Aardvark Technical Services.....82	342	Essex Publishing Company.....35	37	Mullen Computer Products.....42, 171
496	Acorn Software Products, Inc.....17	472	Exatron.....13	81	Multi Business Computer Systems.....146
261	Addmaster Corp.....38	7	Exatron.....24, 25	478	Multi Media Systems.....15
51	Advanced Computer Products.....228, 229	57	Exatron.....203	*	Mumford Micro Systems.....51
109	Adventure International.....46	206	FBE Research Company.....38	*	National Computer Shows.....207
249	Alpha Products Company.....199	70	FMG Corporation.....164	*	Netronics R & D Ltd.....92, 179, 230
56	American Square Computers.....90	169	Fair Radio Sales.....156	473	New Technologies Company.....12
319	Analytical Systems.....128	245	Findex.....185	265	New Technologies Company.....193
349	Apparat, Inc.....62	327	Full Service Accounting & Processing.....166	474	Oasis Systems.....15
481	Apple Computer.....12	131	Full Service Accounting & Processing.....172	485	OK Machine & Tool Corp.....14
314	Apple-Jack.....45	187	G. P. Associates.....38	27	OK Machine & Tool Corp.....109
334	Applied Business Computer Co.....196	75	G. W. Computers Ltd.....173	475	Okidata.....13
220	Aristo/Polks.....202	188	Giltronix.....197	130	Olsensky Brothers, Inc.....156
192	Audio Video Systems.....193	22	Gimix, Inc.....242	89	Omega Sales.....197
488	Aurora Software Associates.....16	42	Godbout Electronics.....227	140	Omnitek Systems.....185
55	Automated Simulations.....141	84	Mark Gordon Computers.....137	29	Optimal Technology, Inc.....125
96	Avionic Enterprise, Inc.....149	239	Mark Gordon Computers.....98	310	Orange Micro.....85
326	B K M Microsystems Corp.....166	491	Graham-Dorian Software Systems.....16	329	Orion Software.....166
211	Bill's Micro Services.....193	168	Harris Data Systems.....202	149	Osborne/McGraw Hill.....123
498	C D S Corp.....17	483	Heath Co.....13	106	PAIA.....28
110	CFR Associates.....74	236	Heath Co.....Cili	246	Pacific Exchanges.....35
256	C P U Shop.....95	10	Hobby World Electronics.....226	274	Pacific Exchanges.....50
79	C & S Electronics Mart, Ltd.....50	33	Houston Micro Computer Technology.....59	71	Pan American Electronics (A Radio Shack Authorized Sales Center).....140
148	California Computer Systems.....156, 157	209	Ian Electronics.....203	495	Pegasus Software.....17
103	California Sun Computer Systems.....43	264	Industrial Marine Electronics.....179	160	Pegasus Software.....103
259	Carlson, Edward.....179	469	Information Technology, Inc.....14	13-16	Percom Data.....Cil
58	Checks To Go.....29	242	Information Technology, Inc.....121	17	Percom Data.....10, 11
497	Cognitive Electronics Laboratory.....17	128	Innovative Technology.....133	112	The Peripheral People.....185
317	Commerce Tours International, Inc.....146	40	Instant Software.....150-153, 189	303	Personal Computer Systems.....117, 141
94	Compleat Systems.....86	477	Integral Data Systems.....12	476	Personal Micro Computers.....12
90	CompuCover.....164, 205	77	Integrand Research Corp.....188	49	Priority One.....236, 237
43	CompuMart.....178	78	Integrand Research Corp.....205	11	Programma International.....55
147	Compuserve.....67	138	Integrated Service Systems, Inc.....129	202	Progressive Computing.....193
336	CompuSoCo.....132	218	Interactive Microware.....193	137	Quant Systems.....188
32	CompuSoft Publishing.....39	235	Interlude.....147	295	Quasar Data Products.....47
183	Computer Action.....197	196	Intertec Data Systems.....3	44	Quest Electronics.....219
215	Computer Applications Tomorrow.....203	343	Intertec Data Systems.....31	52	RNB Enterprises.....221
142	Computer Center.....133	99	JB Engineering.....125, 146	101	Racet Computes.....103
278	Computer City.....75	180	JES Graphics.....202	*	Rainbow Computing, Inc.....202
97	Computer Corner of NJ.....87	92	JPC Products.....74	117	Realty Software Company.....196, 206
184	Computer Data Services.....202	48	Jade Computer Products.....222, 223	20	The Robb Report.....71
18	Computer Design Labs.....73	41	Jameco Electronics.....232, 233	102	Robertson Electronics.....184
152	Computer Distributors, Inc.....117	164	Jini Microsystems.....87	479	Rochester Data, Inc.....14
340	Computer Forms.....38	247	Joe Computer.....117	74	Rondure Company.....87
133	Computer Information Exchange, Inc.....202	472	Kaiglo Electronics.....15	321	SS-50 Newsletter.....179
323	Computer Products International.....50	222	Kaiglo Electronics.....184	348	SZ Software Systems.....74
80	Computer Services.....45	*	Kilobaud Microcomputing	281	Scelbi Publications.....91
36	Computer Shopper.....99		.....66, 113, 189, 196, 206, 214-217	208	Service Technologies, Inc.....203
283	The Computer Stop.....167	198	LNW Research.....196	487	Simulation Software.....16
105	The Computer Stop.....50	59	Leedex Corp.....65	67	Sirius Systems.....142
331	Computer Support Systems.....202	23	Level IV Products, Inc.....120	132	68 Micro Journal.....108
26	Computers Unlimited.....29	*	Lifboat Associates.....160, 161	231	Small System Software.....102
227	Computers Wholesale.....116	53	MOM'S.....104, 105	302	Software Development & Training.....203
6	Computronics.....163	219	MTI.....197	322	Software Mart.....18, 19
297	Concord Computer Components.....231	234	Macco Manufacturing.....196	229	The Software Trader.....185
228	Cuddly Software.....133	72	Magnetic Media Distributors.....173	294	Software Review.....199
141	Custom Electronics, Inc.....133	129	Med Systems.....108	306	Spectrum Software.....79
*	Cybernetics, Inc.....129	203	Merrimack Systems.....184	288	The Stocking Source.....33
136	DAR Sales.....185	494	Micro Architect.....17	489	Strategic Simulations, Inc.....16
34	Dr. Daley.....72	492	Micro Business World.....16	162	Structured Program Designers.....86
212	Dare Data & Design.....132	490	Micro-Comp, Inc.....16	152	Sun Technology, Inc.....172
*	Data Analysis Systems.....132	151	Micro Comp Software Systems.....166	165	Systems Go.....103, 210
293	Data Equipment Supply.....213	167	Micro Computer Industries.....178	189	TAB Sales Company.....220
46	DataSoft, Inc.....205	499	Micro Data Base Systems.....17	279	Taranto & Associates.....35
493	Data Train, Inc.....16	126	Micro Discount Service.....202	118	Telecompute Integrated Systems.....203
*	Delta Systems.....220	309	Micro Magazine.....205	*	Tora Systems.....125
111	Deltroniks.....203	100	Micro Management Systems.....118	95	Total Information Services.....139
182	Des Moines Computer.....203	66	Micro Matrix.....38	313	Total Information Services.....139
73	Digital Graphic Systems.....128	176	Micro Products Unltd.....133	484	Transam.....15
61	Digital Marketing.....115	154	Micro Technology, Unltd.....175	233	Tri-Star Corporation.....185
38	Digital Marketing.....93	30	Microcomputer Technology, Inc.....62	181	US Robotics.....133
*	Digital Research: Computers.....238	260	The Microcomputer Warehouse.....196	325	Urban Aggregates.....193
*	Digital Research: Parts.....86	68	Micromail.....83	64	V R Data Corporation.....199
199	Discount Computer Products.....108	253	Micron, Inc.....166	480	Vector Graphic, Inc.....13
145	Documan Software.....185	123	Microsette.....196	45	Wallen Electronics.....234
87	Dwo Quong Fok Lok Sow.....74	486	Microsoft.....16	*	Wameco.....235
82	Ecosoft.....135	347	Microtek, Inc.....4	28	Web Associates.....135
83	Ecosoft.....136	86	Mid East Micro.....CIV	240	Web Associates.....164
60	80 Microcomputing.....149	*	Midwest Scientific Instruments.....235	470	Wintek Corp.....14
156	Educational Software Professionals.....206	* Mikos.....38		163	Wintek Corp.....202
116	Elcomp Publishing, Inc.....161	255	Miller Microcomputer Services.....239	122	World Wide Electronics.....35, 188
345	Electrolabs.....28	226	Mini Micro Mart.....211		
93	Electronic Specialists.....44	275	Mini Micro Mart.....240		
47	Electronic Systems.....224, 225	50	Mini Micro Mart.....94		
25	Electronics Book Club.....81	304	Mini Micro Mart.....94		

*This advertiser prefers to be contacted directly.

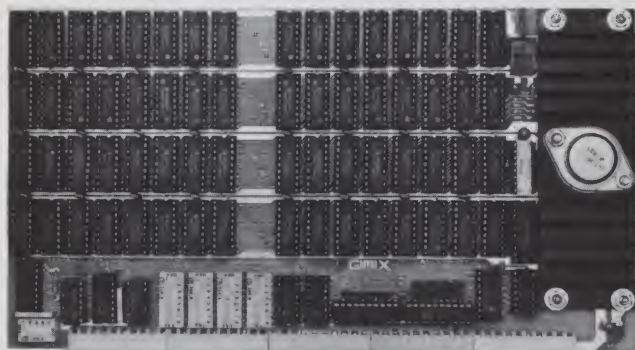


LOOK

WHAT'S COOKING on the FIFTY BUS 32K STATIC RAM BOARDS

Designed for use with:

- ★ Existing SS50 Systems ★ SS50C Extended Address Systems



- Assembled
- Burned In
- Tested

16K . . . \$328.12

24K . . . \$438.14

32K . . . \$548.15

16K and 24K Versions are socketed for 32K and require only additional 2114's for expansion.

FEATURES:

- Decoding for 4 Extended Address Lines (allows memory decoding up to 1 megabyte)
- DIP-switch to set extended addressing or disable it
- 4 separate 8K blocks, addressable to any 8K boundary by DIP-switch
- Each 8K block may be individually disabled
- Write protect either of two 16K sections
- Low power consumption — uses 2114L low power RAMS
- Fully Socketed
- Gold Bus Connectors
- Guaranteed 2MHz operation

AND NOW . . . GIMIX OFFERS YOU A Choice of 6800 or 6809 CPU CARDS

You can order your system to fit your needs or select one of the below featured systems. Please contact the factory for further information and availability.

Add as much memory as you need using GIMIX Static RAM Cards for the utmost in reliability.

32K 6800 SYSTEM \$1,694.59

Includes: Chassis, 6800 CPU, 32K RAM BOARD, I/O card

32K 6809 SYSTEM \$1,844.69

Includes: Chassis, 6809 CPU, 32K RAM BOARD, I/O card

32K 6809 PLUS SYSTEM \$1,994.79

Includes: Chassis, 32K RAM BOARD, I/O Card, and features our 6809 PLUS CPU Card with the Time of Day Clock option with battery back-up installed, as well as the 6840 Timer Package that provides 3 independent 16 bit counters.

This system also allows the following options to be added at additional cost:

- Battery back-up of the 1K RAM by substituting CMOS parts.
- A 9511 or 9512 Arithmetic Processor.
- GIMIX or SWTP Dynamic Address Translators.

EXPORT NOTES:

For 50Hz 230V C.V. POWER SUPPLY Add \$30.00
80 x 24 VIDEO BOARDS — Specify Format (No Added Charge)

On Orders under \$250.00 for a Single Board, or Chips, please Add \$30.00 Handling and we will ship Air Mail Prepaid. On all other orders we will ship via Emery Air Freight Collect, and we will charge no handling. All orders must be prepaid in U.S. Funds. Please note that foreign checks have been taking about eight weeks for collection, so we would advise wiring money or checks drawn on a bank account in the U.S. Our bank is the Continental Illinois National Bank of Chicago, Account #73-32033. Visa or Master Charge also accepted.

FACTORY PRIME STATIC RAMS

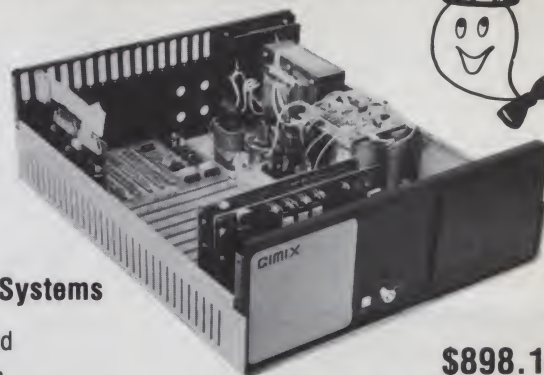
2114L 450 ns . . \$5.90 300 ns . . \$6.40 200 ns . . \$6.90

4044 450 ns . . \$5.90 250 ns . . \$6.90

ADD \$5.00 HANDLING ON ORDERS UNDER \$200.00

GIMIX® and GHOST® are Registered Trademarks of GIMIX INC.

THE CLASSY CHASSIS



\$898.19

- 25 amp (5V) ferro-resonant constant voltage power supply.
- Heavy weight aluminum cabinet with 3 position key switch, fan, and provisions for two 5" disk drives;
- 6800/6809 Mother Board, fifteen 50 pin and eight DIP-switch addressable 30 pin slots (gold plated pins), fully decoded;
- Baud rate generator on I/O section of Mother Board.

I/O BOARDS

for the 30 PIN BUS:

1 Port Serial \$ 88.41
(RS 232 or 20MA, current loop)
2 Port RS 232 Serial 128.43
2 Port Parallel 88.42

for the 50 PIN BUS:

8 Port RS 232 Serial 288.40
8 Port RS 232 Serial 318.46
with on board Baud Rate generator.
8 Port Parallel 198.45

BOTH 6809 SYSTEMS FEATURE OUR

NEW TERMINAL BASED GMXBUG 09 SYSTEM MONITOR

GMXBUG 09 includes advanced debugging tools, utility, and memory manipulation routines.

Both 6809 Systems:

- ★ Can be reconfigured to allow use of other system monitors (OS-9 and SBUG-E)
- ★ Include 1K of Scratchpad RAM on the CPU
- ★ Allow optional software switching of system monitors.

2MHz 6809's at slight additional cost when they become available.

Phone, write, or see your dealer for details and prices on our broad range of Boards and Systems for the SS50/SS50C bus and our AC Power Control Products for all computers.



GIMIX inc.

The Company that delivers
Quality Electronic products since 1975.

1337 WEST 37th PLACE, CHICAGO, IL 60609
(312) 927-5510 • TWX 910-221-4055

READER SERVICE

Please help us to bring you a better magazine—by answering these questions:

I. I am interested enough in a general-interest article to see it in lieu of a technical article.

- ☐ 1. Yes
☐ 2. No

II. The following types of general interest articles appeal to me most (check two only).

- ☐ A. Humor
☐ B. Interview with users/industry leaders
☐ C. Historical
☐ D. Essay
☐ E. Profile of a business

III. As a reader of Microcomputing, I consider myself a

- ☐ 1. Beginner
☐ 2. Intermediate
☐ 3. Expert

IV. The articles in Microcomputing are

- ☐ A. Too simple
☐ B. Too complex
☐ C. Just right

V. I want to see more industry news in Microcomputing

- ☐ 1. Yes
☐ 2. No

VI. The following major computer publication gives me the most usable information (check only one)

- ☐ A. Kilobaud Microcomputing
☐ B. 80 Microcomputing
☐ C. Byte
☐ D. Interface Age
☐ E. Personal Computing
☐ F. Creative Computing
☐ G. Dr. Dobb's Journal

VII. I want to see more regular departments in Microcomputing

- ☐ 1. Yes
☐ 2. No

VIII. I bought this magazine on the newsstand because (answer only if question applies)

- ☐ A. I was looking specifically for Microcomputing
☐ B. The cover caught my eye

IX. I want to see more of the following kinds of articles in Microcomputing (check two only)

- ☐ 1. Business
☐ 2. Construction
☐ 3. Education
☐ 4. Game
☐ 5. Home application
☐ 6. Human interest
☐ 7. Programming technique
☐ 8. Review
☐ 9. Scientific

X. Is the advertising content of the magazine a primary reason for your buying Kilobaud?

- ☐ A. Yes
☐ B. No

XI. What type of computer do you own? (Check all that apply)

- ☐ 1. Apple
☐ 2. PET
☐ 3. TRS-80
☐ 4. Atari
☐ 5. Heath
☐ 6. TI
☐ 7. Other

XII. If you are not a subscriber, please circle 500.

Reader Service: Return this card to receive full information on the products advertised in this issue. Refer to the ad. You will find numbers near the logo of each advertiser. Each represents the advertiser's individual Reader Service number. Circle the corresponding numbers on one of the cards on this page, include your name, address & zip, and drop in a mailbox. In 4-6 weeks you'll hear from the advertiser directly. *This card valid until September 30, 1980*

1	6	11	16	21	126	131	136	141	146	251	256	261	266	271	376	381	386	391	396
2	7	12	17	22	127	132	137	142	147	252	257	262	267	272	377	382	387	392	397
3	8	13	18	23	128	133	138	143	148	253	258	263	268	273	378	383	388	393	398
4	9	14	19	24	129	134	139	144	149	254	259	264	269	274	379	384	389	394	399
5	10	15	20	25	130	135	140	145	150	255	260	265	270	275	380	385	390	395	400
26	31	36	41	46	151	156	161	166	171	276	281	286	291	296	401	406	411	416	421
27	32	37	42	47	152	157	162	167	172	277	282	287	292	297	402	407	412	417	422
28	33	38	43	48	153	158	163	168	173	278	283	288	293	298	403	408	413	418	423
29	34	39	44	49	154	159	164	169	174	279	284	289	294	299	404	409	414	419	424
30	35	40	45	50	155	160	165	170	175	280	285	290	295	300	405	410	415	420	425
51	56	61	66	71	176	181	186	191	196	301	306	311	316	321	426	431	436	441	446
52	57	62	67	72	177	182	187	192	197	302	307	312	317	322	427	432	437	442	447
53	58	63	68	73	178	183	188	193	198	303	308	313	318	323	428	433	438	443	448
54	59	64	69	74	179	184	189	194	199	304	309	314	319	324	429	434	439	444	449
55	60	65	70	75	180	185	190	195	200	305	310	315	320	325	430	435	440	445	450
76	81	86	91	96	201	206	211	216	221	326	331	336	341	346	451	456	461	466	471
77	82	87	92	97	202	207	212	217	222	327	332	337	342	347	452	457	462	467	472
78	83	88	93	98	203	208	213	218	223	328	333	338	343	348	453	458	463	468	473
79	84	89	94	99	204	209	214	219	224	329	334	339	344	349	454	459	464	469	474
80	85	90	95	100	205	210	215	220	225	330	335	340	345	350	455	460	465	470	475
101	106	111	116	121	226	231	236	241	246	351	356	361	366	371	476	481	486	491	496
102	107	112	117	122	227	232	237	242	247	352	357	362	367	372	477	482	487	492	497
103	108	113	118	123	228	233	238	243	248	353	358	363	368	373	478	483	488	493	498
104	109	114	119	124	229	234	239	244	249	354	359	364	369	374	479	484	489	494	499
105	110	115	120	125	230	235	240	245	250	355	360	365	370	375	480	485	490	495	500

Name _____
Address _____
City _____ State _____ Zip _____

Microcomputing • POB 2741 • Clinton IA 52735

BOOKS

Please send me the following Microcomputing products:

Qty.	Catalog #	Title	Unit Price	Total

Add \$1 shipping/handling _____
Total _____

Please allow 4-6 weeks for delivery. No C.O.D.s accepted.

Enclosed \$ _____ ☐ Check ☐ M.O.

Bill: ☐ AE ☐ MC ☐ Visa

Card # _____ Exp. date _____
Signature _____ Interbank # _____
Name _____
Address _____
City _____ State _____ Zip _____

8/80

Microcomputing • Mail Order Dept. • Peterborough NH 03458

SUBSCRIPTION

MICROCOMPUTING
subscribers save \$10
off the
newsstand price.

☐ New subscription ☐ Renewal

☐ 1 year —\$25

☐ 2 years—\$38

☐ 3 years—\$53

Enclosed \$ _____ ☐ Check ☐ M.O.

Bill: ☐ MC ☐ Visa ☐ AE ☐ me

Card # _____ Exp. date _____
Signature _____ Interbank # _____
Name _____
Address _____
City _____ State _____ Zip _____

Canada—\$27, 1 year only, US funds.

Other foreign—\$35, 1 year only, US funds

308B9

Microcomputing • POB 997 • Farmingdale NY 11737



BUSINESS REPLY CARD

FIRST CLASS PERMIT NO. 1024 PETERBOROUGH NH 03458

POSTAGE WILL BE PAID BY ADDRESSEE

kilobaud

MICROCOMPUTING

T.M.

Subscription Dept.

POB 997

Farmingdale NY 11737



BUSINESS REPLY CARD

FIRST CLASS PERMIT NO. 1024 PETERBOROUGH NH 03458

POSTAGE WILL BE PAID BY ADDRESSEE

kilobaud

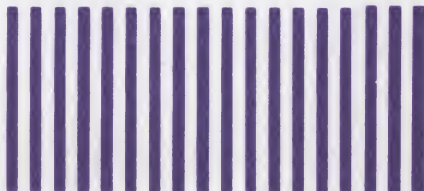
MICROCOMPUTING

T.M.

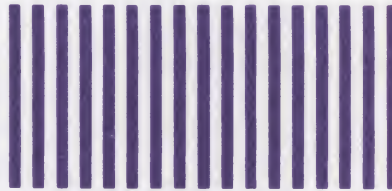
Peterborough NH 03458

Att. Mail Order

NO POSTAGE
NECESSARY
IF MAILED
IN THE
UNITED STATES



NO POSTAGE
NECESSARY
IF MAILED
IN THE
UNITED STATES



kilobaud
MICROCOMPUTING

BUSINESS REPLY CARD

FIRST CLASS PERMIT NO. 217 CLINTON IA 52735

kilobaud

POSTAGE WILL BE PAID BY ADDRESSEE

MICROCOMPUTING

T.M.

POB 2741

Clinton IA 52735

NO POSTAGE
NECESSARY
IF MAILED
IN THE
UNITED STATES



Do more than ever before— spend less than you planned



Heath makes the All-In-One Computer more versatile

Many satisfied customers know Heath takes the risk out of buying a balanced computer system. With the Heathkit All-In-One Computer, you get 16K Random Access Memory (expandable to 48K), keyboard, video terminal and floppy disk system — together in one self-contained, compact unit — for up to hundreds of dollars less than comparable systems.

Heath now makes the All-In-One Computer more versatile than ever! The new Heathkit H77 Floppy Disk System gives the All-In-One even more data storage and recall capacity. Combined, the All-In-One and H77 Floppy Disk give you up to 300K

bytes of on-line data storage — enough to hold entire files. You can mount operating system and program disks at the same time, to make computing even faster.

You can run programs written in MICROSOFT™ BASIC™ and Assembly Languages, and all current software written for the popular Heathkit H8 Computer.

Heath User's Group (HUG) will share with you a library of over 500 programs to make your computer serve you in ways you never imagined.

There's no better way to learn about computer systems — and save money — than by building one yourself.

Concise, easy-to-follow Heathkit assembly manuals show you the way, from start to finish. And a nationwide network of service centers protects your computer investment.

Join the Heathkit computer family today — and pocket the savings!

For complete details on Heathkit computer systems, as well as nearly 400 other electronic kits for your home, work or pleasure, send today for your free, value-packed Heathkit catalog. Or pick up your copy at the nearest Heathkit Electronic Center.

Heathkit®

✓ 236

SEND FOR FREE CATALOG

VISIT YOUR HEATHKIT STORE

Write to: HEATH COMPANY,
DEPARTMENT 351-684
BENTON HARBOR, MI 49022



In the U.S. and Canada, visit your nearby Heathkit Electronic Center where Heathkit products are also displayed, sold and serviced. See the white pages of your phone book. In the U.S., Heathkit Electronic Centers are units of Veritechnology Electronics Corporation.

CP-184



The Businessman's Business System

MSI Business Computer Systems offer flexibility and expandability unmatched by any other microcomputer system, large or small. Our SDOS operating system is totally device independent and supports up to four users. This means that you can start with a single user, dual drive, floppy disk system today, and add up to 80 megabytes of hard disk with additional workstations tomorrow. As your business grows, your MSI system grows with you—and your software won't become obsolete.

Perform text processing tasks at one workstation while entering sales orders on another. Add a third workstation in inventory control and a fourth in accounting. That's expandability!!!

- MSI Inventory Software, with complete Bills of Material, provides a complete inventory control and management system for manufacturers.
- Complete manufacturing forecasting, with production pick lists, allows automatic adjustment of component inventory levels.
- All transactions resulting in any change to the inventory data base are written to audit trail files listing date,

time, operator's name, inventory item, and the changes which were made.

- Sales Order Entry/Accounts Receivable Software displays customer balances and credit standing as new orders are entered. Correct product prices and descriptions are obtained from inventory files if desired.
- Invoices are generated automatically as orders are shipped. Customer statements, with aged accounts receivable, are printed on demand.
- Purchase Order Entry/Accounts Payable Software optionally link to inventory program, in order to easily visualize inventory items which are on order.
- General Ledger programs link to the accounts receivable and accounts payable modules for easy updates and posting.
- If your business is expanding and you would like to know how an MSI Computer System can help you make it more profitable, call or write Midwest Scientific Instruments, 220 W. Cedar, Olathe, Kansas 66061, (913) 764-3273, TWX 910 749 6403 (MSI OLAT), TELEX 42525 (MSI A OLAT).



Small Computers For Big Jobs

Midwest Scientific Instruments